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It is available in a small curved (or straight) needle of
fine quality. It is available in the standard type-
cotton or silk. The purpose of the suture is
mouth opening and closing of the
nasal whistling. It is available in
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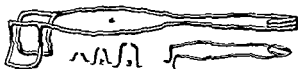
Retractors for

GENERAL SURGERY

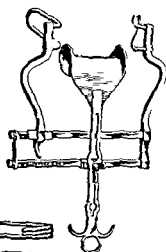
A Selection of Useful
Standard Retractors for
Surface and Deep Work



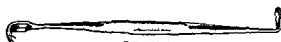
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l d t bl d Chr m plat d E h \$16 50

GO 800—FARR w t t N l tw mall
gl pr gs 5 ch Chr m plated E ch \$1 75

GO 801—FARR wir t t N tw med m
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SURGERY

GYNECOLOGY AND OBSTETRICS

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NUMBER 1

PRIMARY RESECTION (CLOSED ANASTOMOSIS) OF RECTAL AMPULLA FOR MALIGNANCY WITH PRESERVATION OF SPHINCTERIC FUNCTION

Together with a Further Account of Primary Resection of the Colon and Rectosigmoid and a Note on Excision of Hepatic Metastases

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SOMEWHAT more than 2 years ago the results in this clinic of primary resection of the colon without antecedent complementary or supplemental colostomy save in the presence of acute obstruction were set forth (34). At the same time a preliminary report was made upon efforts directed at salvage of sphincteric function in the radical abdominal operation for carcinoma of the rectal ampulla.

It is the writer's intent in this paper to report upon the experience of this clinic with the surgery of colonic malignancy since the time of the earlier report (April 1943) and to elaborate particularly upon a more extended experience with the operation for carcinoma of the rectal ampulla with attempts at preservation of sphincteric function. Whereas experience with this latter operation still has been

small nevertheless it has been adequate to indicate that in suitable cases radical excision of the lesion with preservation of sphincteric function is a feasible and practical procedure.

HOSPITAL MORTALITY IN PRIMARY RESECTION OF COLON AND RECTOSIGMOID

The earlier report referred to above embraced a 2 year period during which time 61 patients underwent colonic resection with 1 hospital death. During the 19 month interval which has elapsed since that report (April 1943 to November 1, 1944) an additional 78 patients have undergone resection of the colon including the rectosigmoid. All were primary resections save 2 in which exteriorization was done. One of these had a volvulus of the pelvic colon, the other an inflammatory lesion in the transverse colon. There were 6 deaths in the group, 3 of which are classified as unavoidable, 2 the result of peritonitis and 1 of pneumonia.

Unavoidable deaths. In 1 of these patients primary resection was undertaken at the time

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TABLE I—HOSPITAL MORTALITY

	A P m ry Resec				B An il ry Resec			
	N f p	Hosp d h	3 P 1	L d th	N f	H d h	3 P 1	L d th
Se es I	6		6					
Se es II 43	78	6	6					
44								
T l								
Comb d f l & ec m)	66							

of decompression of the colon for acute obstruction. This patient had a malignant growth in the pelvic colon with great distention. It obviously was a mistake in this instance to have undertaken decompression of the colon and primary anastomosis at the same time. The success of primary resection without antecedent or complemental colostomy in the earlier series suggested that it might be feasible to deal with the obstructed colon in the manner in which the obstructed small bowel is managed at operation by aseptic decompression suction enterotomy (). Upon decompression the edematous walls of the obstructed colon however appear to separate into layers making suture somewhat difficult. This occurrence was noted too in a subsequent case in which primary resection of the pelvic colon was undertaken soon after spontaneous decompression of an enormously distended colon.

The other death from peritonitis occurred in a patient with a dubiously operable lesion adherent to the urinary bladder and the anterior as well as the posterior abdominal wall. In the light of the extensive operation undertaken in this patient it might have been well to have made a complemental colostomy. Obviously in the case of the patient with the acute obstruction an antecedent colostomy should have been carried out.

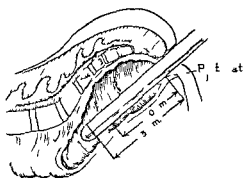
One of the avoidable deaths requires special comment. It occurred in an obese elderly man with carcinoma of the transverse colon who also had a moderately active diverticulitis of the pelvic colon causing some symptoms. Primary resection of the transverse colon was

done the patient dying of pneumonia. In this patient an exteriorization operation probably would have been tolerated better. It too would have been better treatment for the diverticulitis. The only other alternative would have been to excise the major portion of the colon anastomosing cecum to the terminal pelvic colon, an operation even more formidable than the one the patient did not survive. It would have possessed the advantage however of ridding the patient of the complicating diverticulitis.

The most complicated resections in this series of colon cases are constituted by the transverse colon group. Of the 1 patients in the group 7 had simultaneous resection of the stomach pancreas or other viscus. In these 7 patients the primary lesion was a gastric lesion, a gastrojejunocolic fistula or a carcinoma with invasion of the transverse colon. The case referred to was the only death in the transverse colon group.

The operative mortality for these two periods of study is summarized in Table I. For the earlier period the operative mortality was 16 per cent for the latter 7.6 per cent for both periods together 5 per cent. It is to be noted however that there were no unavoidable deaths in the latter period whereas in the latter there were 3 (see Table I). In any series of patients operated upon for cecal malignancy the item of unavoidable deaths looms large (35). An element of unusual good fortune attended our efforts in the first series in which there were no deaths from unavoidable cause in the latter series half (4 deaths out of 6) was unavoidable.

Unavoidable deaths The unavoidable deaths were due to (1) heart failure in an obese badly decompensated patient with a large in vasive lesion of the rectosigmoid (2) arterial thrombosis of both renal arteries in a decompensated patient who underwent primary resection for cancer of the pelvic colon (3) an unexplained sudden death in a diabetic (not insulin shock as far as the record indicates) approximately 48 hours after an easy primary resection for carcinoma of the pelvic colon



HOSPITAL MORTALITY IN AMPULLARY RECTAL RESECTION

Since the former report 20 additional patients have been operated upon with a view to preservation of the rectal sphincters of these one a man of 80 years died during the post operative period of coronary thrombosis a mortality of 5 per cent Of the 7 operated upon in the initial series 1 died of pyelonephritis and oliguria through the injudicious administration of sulfathiazole a mortality of 14 per cent The mortality for both series 2 deaths in 27 patients is 7.4 per cent¹

ARBITRARY SURGICAL DEFINITION OF DIVISION OF LESIONS OF RECTOSIGMOID AND RECTAL AMPULLA

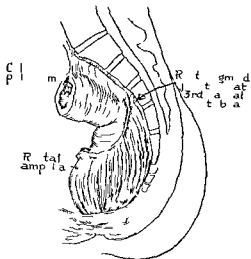
The arbitrary surgical definition of division of lesions of rectosigmoid and rectal ampulla was discussed in the previous report and the problem was resolved by placing the point of division at 10 centimeters from the anus (Fig 1). Increased experience shows this to be a satisfactory arbitrary divisional point. In resections of the rectosigmoid and rectal ampulla I have set myself the task of trying to excise routinely a minimum of 3 centimeters of normal mucosa beyond the most distal palpable margin of the tumor at operation a task easier of accomplishment in lesions of the rectosigmoid than for cancer of the rectal ampulla. In the excised rectal specimen the pathologist not infrequently indicates that the margin of normal mucosa on the distal side of the tumor is less than 3 centimeters. This difference is due in part to retraction and shortening following division yet these short seg

Fig. 1. A. B. T. Y. D. S. T. f. g. e. a. l. d. s. l. p. t.
d. t. u. n. g. u. i. g. l. f. t. h. t. o. s. g. m. d. f. m. t. h. t. m.
L. e. s. n. s. w. h. l. s. b. l. p. l. p. b. l. e. d. g. s. m. t. h.
t. m. t. f. r. m. t. h. p. c. t. n. a. t. h. c. l. f. i. d.
t. g. m. d. l. t. h. h. h. t. h. l. e. p. l. p. b. l. b. l.
e. d. g. f. t. h. t. m. r. s. t. h. t. m. t. e. (o. l.) f. t. h.
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t. t.) T. h. t. m. f. t. h. d. l. t. d. b. e. d. b. y. t. m. t.
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p. n. t. d. f. m. s. g. e. r. y. 9. 4. 3. 4. 4. 3.)

ments of normal mucosa beyond the rectal lesion on the excised specimen accompanied by an adequate length of normal mucosa on the proximal side of the tumor indicate some of the difficulties that beset the surgeon in meeting satisfactorily the requirement of adequate and complete excision of the lesion by ampullary resection

As stated in the initial report rarely is it necessary in lesions whose lower limit is more than 10 centimeters from the anus to mobilize the rectum extensively posteriorly in order to establish intestinal continuity. On the contrary in lesions below 10 centimeters regularly it becomes necessary to mobilize the rectum by division of the middle hemorrhoidal arteries and posterior mobilization to the tip of the coccyx in order to permit of reestablishment of intestinal continuity by suture. Furthermore there appear to have been no special problems of wound healing attending resection in lesions whose lower proctoscopic limit was more than 10 centimeters from the anus whereas primary healing occurred only in a minority of the cases in which intestinal union was effected by suture in lesions lying less than 10 centimeters from the anus. This

E. g. b. d. d. i. p. n. m. r. y. m. l. l. y. s. e. c. l. o. w. l. i. s.
h. a. v. e. b. e. d. o. n. w. i. t. h. m. s. i. m. l. b. p. e. d. p. o.
d. b. e. b. e. b. o. e. l. m. l. p. e.



F Th t m d l p l m Th l t t
 n d p t f t t m p t d
 lly t t t p t f t b p l v l A t h
 k t h d f m C n i f t m y d t t h
 p t m t t h t M b l t f t h d p t
 c d l t t h t u m

report will concern itself particularly with the experiences gained in this clinic with the problem attending resection of low lying lesions, re establishment of intestinal continuity and preservation of sphincteric function.

CAUSES OF POOR WOUND HEALING IN RESECTION OF AMPULLARY RECTAL LESIONS

Granted satisfactory suture primary healing is the rule in all resections of the colon and the rectosigmoid. The primary difficulty undoubtedly with the low lying lesions is the vascular factor. That is mobilization of the rectum to the tip of the coccyx accompanied by division of the middle hemorrhoidal arteries compromise satisfactory vascularization of the lower segment. Furthermore separation of the rectum from the sacrum leaves a space posteriorly in which fluid will accumulate unless provision is made for drainage.

In resections of the stomach, small intestine or colon the surgeon may determine readily by proximity of blood vessel to the segments to be anastomosed as well as by the color whether blood flow will be adequate. The situation in low lying rectal lesions with respect to resection is not unlike that of total gastrectomy done from within the abdomen.

As has been indicated elsewhere gastric resections up to 95 per cent may be done without special increase of risk above that assumed in the elective 75 per cent resection performed for ulcer (33). When however the stomach is excised completely the mobilized esophagus is deprived of a portion of its blood supply coming from phrenic and gastric vessels. Whereas a satisfactory suture can be made readily in total gastrectomy unless the esophagojejunal anastomosis is covered in the manner described by me in 1937 (31) and again by Graham in 1940 (14) fistula formation late in convalescence with development of a subphrenic abscess is not unusual.

In ampullary resection there is no opportunity to cover the suture line posteriorly. And anteriorly it is not an easy matter this item will be referred to again with reference to rectovaginal fistula. As far as I can know or ascertain by rectal examination during convalescence after ampullary rectal resection in those instances in which a defect occurred in the suture line the fistula usually was on the posterior rectal wall.

CHOICE OF PROCEDURE IN AMPULLARY RECTAL RESECTION

In the initial report 3 methods of reestablishing intestinal continuity were described: (1) the Hochenegg pull through method with Whitehead excision of the mucosa in the remaining distal segment; (2) the Hochenegg pull through method leaving the rectal mucosa in the distal segment; (3) anastomosis of the proximal and distal segment through a proctoscope.

In the present series all of these three methods have been employed. I have come to feel however that the best method of reestablishing intestinal union in ampullary rectal resection is by the direct suture method made from within the abdomen by the method depicted in Figure 7. Thirteen of the 20 patients in this series were operated upon by the direct suture method. Strange as it may seem after mobilization of the rectum anastomosis may be effected by employment of straight clamps and a single row of fine silk Lembert sutures as close as 5 centimeters from the anus. Obviously it is not an easy anastomosis but

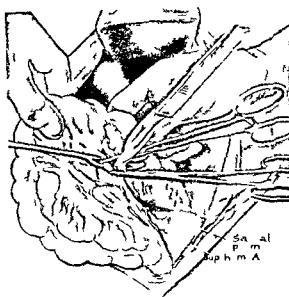


Fig 3 Th t hnaq f amp ll y tal t th p h h d l t y t th l t y
l ft d l t f p t e l d p b ght d f t b th th d f th p l c l

an advantage of this method over anastomosis through the proctoscope is that it may be made as a closed anastomosis. It possesses the advantage over the pull through method that the proximal segment need not be so long in other words the suture method does not risk necrosis of the proximal segment or retraction as does the Hochenegg pull through method.

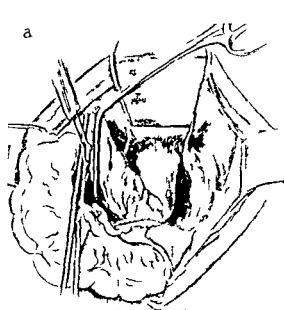
The rectum when empty is not straight as its name implies (Fig 2). There is a deep posterior curve and at least two lateral curves. Not uncommonly therefore when the rectum is mobilized fully the clamp may be applied at the conventional 3 centimeters beyond the lesion permitting resection and anastomosis to be carried out at approximately the same level as the distance which initially separated the anus and the lower limit of the lesion as determined by palpation and proctoscopic examination.

The patients upon whom ampullary rectal resection has been done have been wholly unselected. That is the operation has been done on every patient with carcinoma of the rectal ampulla in whom it was technically feasible to do it. Obviously in several instances the

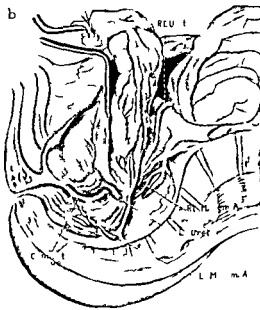
operation was undertaken as a palliative procedure in some of these as the experience reported herein will indicate ampullary resection is not a good operation in that in large circumferential lesions exhibiting local invasion and fixation of the tumor ampullary resection is followed frequently by local recurrence.

TECHNIQUE OF PRIMARY RECTAL AMPULLARY RESECTION

The operation is carried out with the patient in steep Trendelenburg position. Miss Daisy Stilwell medical artist has prepared the accompanying lucid drawings of the operative procedure (Figs 2 to 8) from sketches made after looking over my shoulder at two such operations. They illustrate the technique of the operation far better than I can describe it. The details of the operative procedure up to point of applying a clamp to the distal segment are identical with those of the abdominal perineal operation and consist of the following: (1) delineation of peritoneal flaps lateral to the colon; (2) isolation division and ligation of superior hemorrhoidal vessel at the sacral promontory (Fig 3b); (3) division of the



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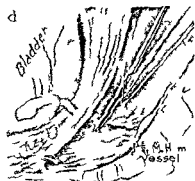
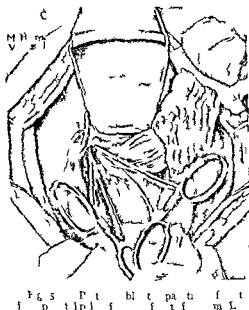
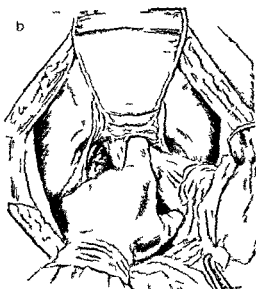
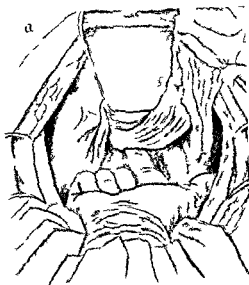
colon and pelvic mesocolon (Fig 4a) (4) mobilization of the rectum to insure excision of 3 centimeters of rectal mucosa beyond the lesion (Fig 5a b) and application of the clamp on the distal segment (Fig 6a) (5) preparation of the proximal segment for the anastomosis (Fig 6d e) (6) anastomosis with a single row of fine silk Lembert sutures (Fig 7) (7) through a short vertical perineal incision made directly in front of the coccyx the drawing down from the presacral space of a Penrose drain (Fig 8a b) (8) placement of a No 22 rectal tube through the anastomosis (9) extaperization of the anastomosis and closure of the pelvic floor (Fig 8c d) with suture of the lower portion of the peritoneal flaps beneath the colon and suture of the lateral margins of the colon to the peritoneum again thus effecting double closure of the pelvic floor. Great pains are taken to make an effective closure of the pelvic floor. The peritoneum is mobilized adequately to obviate tension and interrupted silk sutures insure firm union.

Cyclopropane supplemented by periodic small intravenous injections of curare has been the usual anesthetic agent. A moderately longitudinal vertical midline subumbilical or a para-

median rectus incision is employed.¹ The wound is closed with interrupted sutures of fine silk.

In the earlier cases in which the Hochene pull through operation combined with the Whitehead procedure was employed of mobilizing the normal rectal mucosa beyond the lesion through the anus it became necessary to operate alternately from below and above. In order to facilitate that procedure the patient was draped on the table with the leg flexed somewhat. This position created a rather awkward situation particularly for a right-handed first assistant who then found it necessary in the abdominal part of the operation to reach across the partially flexed right thigh of the patient with his right hand. Mr J. H. Phelan of the scientific apparatus shop at the university then built for me a tall and ceiling windlass which permitted the leg to be flexed or let down at will. Dropping the foot board of the operating table permitted access to the perineum from below. However the

Durin h pa ew part d I b ed m d
ca th l ad isa du ec h pos
ea sec h m sc d bd es f j ec b q
lowered with h na d es f j ec b q
anal d fec h



p t f th p t m p l t d u l l y b y h a p
d t b B l t p t o f th t u m f m
d t b d d d g u t e l y f d b y
l p d t f m d d l m b d l l n th
l t l t l f a s c l t t h m t f th t m
d L t l f th h h d l l m p l y
th e t t r y th l t d

abdominal suture method of ampullary resection described herein has made use of the windlass principle important

THE QUESTION OF COLOSTOMY

In colon resections In this clinic antecedent or complementary colostomy has been reserved with few exceptions for the patient with acute obstruction of the colon. Many patients with mild symptoms of colonic obstruction have

been treated by an indwelling tube and large doses of mineral oil permitting resection and primary anastomosis. My associate Dr. Clarence Dennis (7) has called attention to the hazard of bringing about obstruction by the administration of a barium enema to patients presenting threatening signs of obstruction. In this clinic routine practice for some time in lesions throughout the entire colon including the rectosigmoid has been to perform resec-

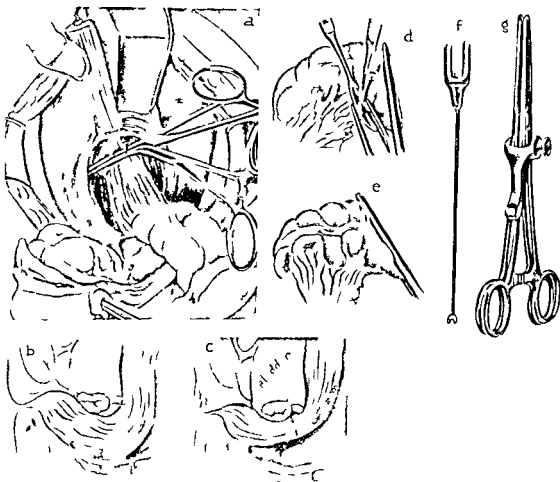


Fig 6 Th t mos l mp h be ppl d t
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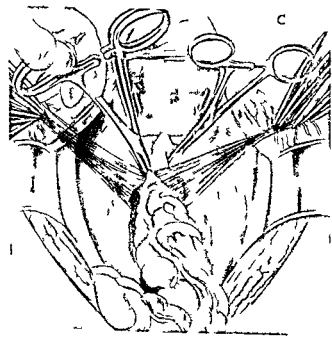
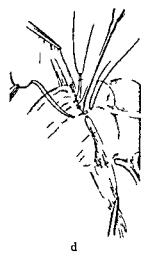
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tion and primary anastomosis without antecedent or complementary colostomy. The regularity with which primary union takes place suggests definitely that colostomy is unnecessary.

An indwelling duodenal tube is allowed to remain *in situ* for 4 and occasionally 5 days after operation. Our experience is that the

indwelling duodenal tube is superior to the Miller Abbott tube in the control of postoperative distention. As has been repeatedly pointed out, however, it is important to employ suction during the induction of anesthesia and during the operation as well as in the early postoperative period. In other words, effective use of the indwelling duodenal tube is the best prophylaxis against distention. The superiority of the Miller Abbott tube in the treatment of acute obstruction of the small intestine or in instances of mild

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 m l pe m ry as mos les ho l m se fli l m bo m ary sec
 so ha bee de so ho bueq dem ds l m bo m ary
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 Th l p th pel l d first
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 t l g t m d l th t es
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colonic obstruction not demanding early operation is admitted freely
 In ampullary rectal resection however employment of complementary colostomy probably will be needed in unobstructed cases

more frequently than in primary resection of the colon and rectosigmoid In this series of cases particularly in those operated upon after the Hochenegg pull through plan supplementary colostomy because of persistent

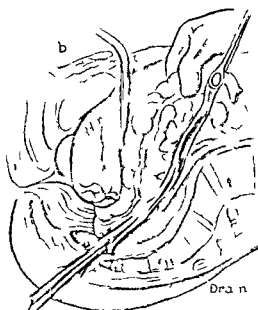
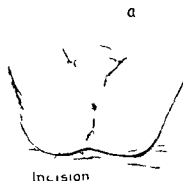


Fig 9 I th p j t t n t th cccy b A P sed d th h
f m b l

fever became necessary in several patients—owing to retrorectal infection (Fig 9). In the main however our present plan is to try to effect primary anastomosis by a single row of interrupted silk sutures elongating the peritoneal cul de sac by suturing the peritoneal flaps beneath the colon and draining the residual presacral space through a small incision in front of the coccyx (Fig 10). Whereas as has been indicated a temporary fistula occurred in the larger number of these cases primary healing without evidence of fistula took place in 4 of 13 patients operated upon by the primary intra abdominal suture method. In 5 of the 13 patients in this group a supplemental colostomy was made because of the occurrence of a rectovaginal fistula. Slight elevation of temperature ordinarily herald the occurrence of a leak in the suture line. Often a systemic reaction. Some fecal material comes away through the drain at The anus is irrigated 10 or three times a day. When the patient becomes afebrile or when it is clear that the leak in the suture line has occasioned no untoward symptom the drain is withdrawn. In a few days the external fistulous opening closes spontane-

ously and the small retrorectal abscess cavity becomes obliterated and the defect in the rectal wall heal. The No 22 rectal tube thread is past the anastomosis at the time of operation allowed to remain in place for nearly a week. 3 day after operation it is withdrawn a centimeter to obviate the possibility of the tip of the tube pressing upon the wall of the pelvic colon causing pressure necrosis. Three days later the tube is withdrawn. In resections of the terminal pelvic colon in which the rectum is not mobilized posteriorly no attempt ordinarily is made at operation to pass a rectal tube beyond the anastomosis for too often easy entry of the tip of the tube into the pelvic colon is prevented by Houston's valve.

SULFONAMIDES UNNECESSARY

As was indicated in the earlier report the only preoperative preparation of the colon and rectum employed in this clinic is the preoperative administration of enemas preceded by the liberal oral administration of mineral oil. It is an empty bowel that is desired. It has not been our practice to employ succinyl sulfathiazole in colonic or rectal surgery. Moreover the local implantation of small

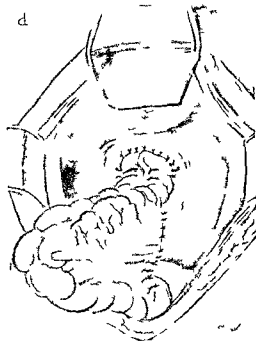
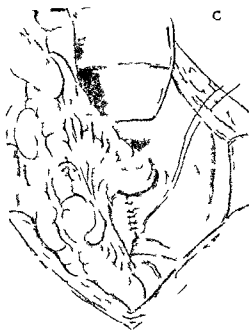


Fig 8 lft Th p t lft p t dt th
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t l l d d ht Th l f th p l p
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t p t l d

amounts of sulfathiazole referred to in the earlier report has been abandoned. In those instances in which a urethral catheter is employed small daily doses of sulfadiazine are given in the early postoperative period to thwart urinary tract infection.

DIETARY MANAGEMENT

All patients are fed a high protein and carbohydrate and low fat diet for a few days prior to operation. In patients who have lost considerable weight the preoperative dietary preparation must be long enough to permit the lipotropic action of such a diet to rid the liver of its excess fat—for patients with fatty liver stand operation poorly. The details of this management have been described elsewhere (9, 3, 33).

THE OCCURRENCE OF RECTOVAGINAL FISTULA

We have learned that drainage through the vagina is inadvisable in any of the methods of ampullary rectal resection. If perirectal suppuration occurs a persistent rectovaginal fistula may follow. Moreover a spontaneous

rectovaginal fistula has been observed twice without drainage of the vagina. My colleague, Dr. John L. McKelvey (17), professor of obstetrics and gynecology (1944), informs me this occurrence is probably owing to the dependence of the posterior vaginal wall on the blood flow from the middle hemorrhoidal arteries which are divided regularly in the operation of rectal resection—an expression which finds confirmation in the anatomical observations of Quenu (4, 1893). The distribution of the branches of the middle hemorrhoidal arteries is principally upon the anterior wall of the rectum above the levatores while the branches of the inferior hemorrhoidal arteries are dispersed largely upon the posterior wall below the levatores (Cunningham). There is no marginal artery of the rectum as in the colon. As the three hemorrhoidal arteries reach the rectal wall they break up into branches which are distributed over and through the rectal wall.

Later in adherent lesions in the female I have excised the uterus and the upper portion of the vagina coincident to reestablishing



F. Drain sit p om l t oc yz mp ll y
 ectal esect by t H h oc f th t
 t mporary h t l th ta (T bl H Ca 4)

T q M sa f th p l l p j t th h
 th l l th H h g p ll th h p t
 (T H H Ca) S l f th gm t t l y
 p d tabl (t) Th: ff f p t d g b l t
 ff l t l ff h th th ph t

intestinal union in ampuillary resection thus insuring better removal of the tumor and avoiding, simultaneously the hazard of a rectovaginal fistula. In a recent case after such a procedure primary union occurred the suture line being 3 centimeters from the anus (Fig. 10).

ARTERIES OF THE RECTUM

Steward and Rankin (1933) give a good account of our available knowledge on the blood supply of the lower colon and rectum. Quenu (1893) and Drummond (1914) have both stressed the inconstancy of well developed anastomosing vessel between the middle hemorrhoidal and the superior hemorrhoidal arteries above the levatores on the one hand and between branches of the middle hemorrhoidal and branches coming from the inferior hemorrhoidal beneath the levatores on the other. The latter communication is even more feeble than the former.

In one of 5 directions Quenu failed to demonstrate any communication between branches of the superior and middle hemorrhoidal arteries on the rectal wall in the *main* the communication was unilateral and not with anastomosing branches on both sides of the rectum as one might expect. Drummond believes the middle hemorrhoidal artery to be an inconstant vessel inasmuch as he was able to demonstrate its presence employing the x-ray injection technique only 5 times in 1 specimens. His diagrams emphasize the importance of the superior hemorrhoidal artery in vascularizing the rectum.

Quenu states that the middle sacral artery gives off usually three small branches at the level of the last sacral vertebra to the posterior aspect of the rectum. Pope and Buie (1919) describe a recto-ectal plexus to which small branches of the middle sacral artery supply an important component.

The superior hemorrhoidal is the chief artery of the rectum and inasmuch as the paired middle and inferior hemorrhoidal arteries are variable and inconstant it is understandable that attending division of the superior and middle hemorrhoidal arteries ampuillary rectal resection difficult with wound healing, and temporary ectal fistula are not uncommon. It has been pointed out

previously that Sudeck's (1907) critical point has no importance in excision of the colon pelvum and the upper rectum. Probably only in the pull through operation is Sudeck's critical point really important. In that procedure as has been pointed out the proximal pelvic colon must be several centimeters longer than is necessary in ampullary resection by the primary suture method. Whereas the bowel is usually long enough the primary difficulty with the pull through maneuver relates to the shortness of the vessels in the mesentery despite all efforts at lengthening them. If the sigmoid mesoartery is cut the marginal vessels along the mesenteric border of the colon may be inadequate to vascularize it. In consequence necrosis and retraction of the segment drawn down through the anus may occur. As in ampullary rectal resection the superior hemorrhoidal artery is divided also in rectosigmoid resections however in the latter operation the communications between the terminal branches of the superior hemorrhoidal and the middle hemorrhoidal on the rectal wall are not disturbed and difficulty with wound healing does not occur.

AMPULLARY RESECTION FOR ULCERATIVE COLITIS

Three of the 27 patients in whom ampullary resection was done had ulcerative colitis. The remaining 24 had cancer of the rectum. In 1 of the 3 patients with ulcerative colitis there was a localized lesion extending from 9 to 14 centimeters from the rectum permitting ampullary resection with anastomosis to the proximal portion of the pelvic colon in another the whole colon was involved and a rectal stricture was present 10 centimeters from the anus (Fig. 11 specimen 8) in this instance the end of the ileum was sutured to the terminal rectum. In the third patient referred to in the initial report the whole colon and rectum were involved necessitating complete excision of both the problem being resolved by pulling the ileum down through the external sphincter after the Hochenegg pull through method accompanied by Whitehead excision of the rectal mucosa from the distal segment. Primary healing did not occur

in any of these 3 patients.¹ Rectal function has been quite satisfactory in the first patients. As was indicated in the first report in the instance of the patient with complete colectomy and proctectomy recourse had to be had to a secondary ileostomy. This patient can retain 4 ounces of water administered by a rectal tube for a period of 8 minutes without too great difficulty and the prospect of again establishing intestinal continuity appears not unlikely. If the Whitehead excision of mucosa from the distal segment had not been employed the prospect of satisfactory rectal function in this patient undoubtedly would be even better.

Sphincteric function. Ampullary resection was undertaken in 27 patients of these 2 died in hospital. In 2 of the remaining 3 patients surviving ampullary resection in whom a supplemental colostomy became necessary no opportunity was afforded to test sphincteric function one of these Mrs. M. R. Univ. Hosp. No. 743136 aged 68 years had hepatic metastases and a growth adherent to the cervix and posterior vaginal wall. A local recurrence precluded secondary closure of the colostomy and excision of the two hepatic nodules. Additional experience has suggested the advantage of excising the uterus and the upper portion of the vagina in such patients. The other patient Mrs. P. P. Univ. Hosp. No. 746841 aged 68 years developed evidence of a pyelonephritis after leaving hospital and died 2 months after operation of a pulmonary embolus. The predisposition of patients having colostomy to development of urinary tract infection appears to be well established.

Of the remaining patients sphincteric function appears to be satisfactory in the majority. All the patients in the group have been followed and observed from time to time. In order that patients might not be persuaded to give more favorable replies at the time of examination than the situation warrants the following inquiry was sent to all patients having had ampullary resection:

1. Is the rectal control satisfactory?
2. Are there periods when the control is not satisfactory?

1. Is the rectal control satisfactory?
2. Are there periods when the control is not satisfactory?

TABLE II—RESULTS IN 27 PATIENTS UNDERGOING AMPULLARY RECTAL RESECTION

N m bos p mbe	ce A	D f f m m	Ch fl	S m l l s my	C mpl	Le gth bos f pe d	S h f	P k
I H h P H T h h Wh h f E f M os f Lo Segm								
Mrs B A 5	F		U l L h h m m	N	T mpo ry h b h b		V ry g d	V ll
I F C 7	8		U l L h h m m	N	T po ry		Good	W ll
I R L 5	1 6		U l L h h m m	N	T mpo ry		Good	W ll
I C F 5	1 6		U l L h h m m	Heos	Pos fec	8	H lds m A l good	V ll S ll h leos
K A F 5	1		U l Le h h m m	N	P l l gu f m l mades		N hserv	Ded h d pos pera
M C W 5	1 5		Se l L h h m m	N	T mpo ry re		Good	D d f ecu m h f pe
A rs L L 8	F	5	U l Le h h m m		Pos fec pa		F v rs An p d m l good	W ll C los oed
S M P M oo	M		C ll m W Le h h m m	C re mf gl L a l m m	l f b	I be pe l b sa	F	W ll E m a, as los d C l h os
II H h P H T h I D S m								
Irs A 5	F ob		l m m h gm m			8	G f	pe bd l pe h
II S 3	1		l m m l	N	O be		F	V ll lo, f l hno
III S as mos b h oc osc pe								
rs F V oo	F		U l les I gth	B cun vo re m			Ex ll	ll
rs J O 5	F		U l Le	ra lesio oo m m	Pos ex	pa Drain ec lus	Go	os pe los m nag
f pes f pe T las pa l be d h d len f gm								

TABLE II—RESULTS IN 27 PATIENTS UNDERGOING AMPULLARY RECTAL RESECTION—Continued

N m d bos l mb	S Ag	D f les f m m	Ch t l l	m p p l m l my	C m p l	Le g h hos y l f pe d y	Sph l	P m k
III S t A m th gh P oct sc p -C d								
M I F s	M s		L C g l m f W gh 95 gm Le g h 9 m	Y	Obe p pos f		Go d	Cl f l D h f m m h pos pe
IV P m ry Closed A mos (S f m Abo)								
Mrs E E 6	F 66	8	U l B V h pol po d l Le b s m	N	N		Ex ll	W ll
Mrs R V 3	F	8	U l B W ed l Le h b gm m	Yes	Pos fec		E ll Col closed m	W ll
M T D	I		U l B Le g l h 7 m h 9 m	N	P pera bo hl b		E ll	W ll
M I R	F	6	B d cure C ra d m f W gb l g h Le h gm m	Y	P R p ov fec fis l g l	3	N bserv	D d 6 m f pe H sed m
M ss h K	F		U l l R m l f ppe m d	II m	Pos fec	6	E ll	W ll H ov my l sed
I C	M 80		U l B V f L h h 63 gm	N	N		N b	D d 5 h pos h mbo d y
M C L	F 6	6	S l l C V iso pol p g l Le h h go m m	N	Ob po pe g l f l Rec	6	Good f ec o f g l fis ul	W ll R f l f p f l
M O C 44	I		L h C W m f L h h 8 m m	N	P f ac	7	Good l	Loc l ecu po d d t h h d m
M J C	M		Broad re B l m f l l segm l Lo l h s m l pe m l we h s m seg l h m	N	Pos	5	E cell	W ll H d rrb l d h o p l
rs R	F 8		La g C l on l k f us Le h m be-us f m na pe (Upe mo)	C m l m los- m be-us f m na pe (Upe mo)	P l h ac pos- fec-		N bserv	Colos my f lan ry los d D d so h m mbol m l d m sal h m

TABLE II—RESULTS IN 27 PATIENTS UNDERGOING AMPULLARY RECTAL RESECTION—Continued

Names	Sex	Age	Defecation	Chills	Fatigue	Sphincter	Complications	Length of hospital stay	Sphincter	Postoperative status
Mrs E J 7	F	6	Normal	None	None	Normal	None	5	Good	Well
5 M M C 7	F	69	Normal	None	None	Normal	None	5	Good	Well
6 Mrs E S 8	F	8	Normal	None	None	Normal	None	5	Good	Satisfactory
7 M J O 7	M	7	Normal	None	None	Normal	None	5	Good	Well

3 Do you find it necessary to wear a diaper or take other precautions against soiling?

4 Can you control gas?

5 Has your activity been limited in any way by the operation on the rectum?

The replies to this questionnaire tallied quite closely with our own evaluation and the results appear in Table II. The patients with excellent or normal sphincteric function all had ampullary rectal resection by the suture method. The same set of questions was submitted to the patients who had undergone resection for carcinoma of the rectosigmoid. Uniformly the sphincteric function of that group seemed to be normal.

The preservation of normal or nearly normal sphincteric function in the majority of the patients undergoing ampullary rectal resection has been very gratifying. In patients in whom a rectal fistula developing from a leak in the suture line was slow in healing and healed with a persistent defect, the rectal wall rectal continence has been impaired. Moreover a rectovaginal fistula has marred an otherwise satisfactory continence in 2 patients. Equally or even more important than local causes in disturbing sphincteric function have

been mental changes owing to senility. Patients who have undergone ampullary resection must be more alert to the necessity of evacuating the lower bowel than the patient with an intact rectum.

Babcock (1932) removes the sphincters and establishes a perineal anus in doing the radical operation for rectal cancer. () Babcock and Bacon (1942) assert (3) that the phincterless perineal colostomy is to be preferred to the abdominal colostomy. Whereas for sentimental reasons the perineum may appear to be a more desirable location for an artificial anus it would seem better to have such a colostomy opening where it may come more directly under the watchful eye of its owner.

Preservation of sex function in males. Loss of sex function or impotence in males after the abdominoperineal operation is well known. Apparently in patients undergoing ampullary rectal resection as in patients having had excision of the rectosigmoid there appears to be little or no impairment of this function.

LOCAL RECURRENCE

Of the 27 patients in whom ampullary resection was done, the operation was un-
der-

taken for ulcerative colitis the remaining 24 had cancer of the rectum. Two of these failed to survive operation. Of the 22 patients surviving ampullary resection for rectal cancer 5 had evinced evidence of local recurrence. In 4 of these ampullary resection was undertaken as a palliative procedure. Yet even in these patients the abdominoperineal operation would have given better assurance against local recurrence. This matter of local recurrence in large fixed lesions has been the most disappointing experience in this effort directed at preserving sphincteric function in ampullary resection. Two of the 5 patients had hepatic metastases at the time of operation. One of these Mrs. M. R. Univ. Hosp. No. 743136 was mentioned under the discussion of the complication of rectovaginal fistula. In one patient the large fixed resected lesion proved to be a gelatinous carcinoma. An abdominoperineal operation was done subsequently but the lesion has recurred again. Miles (1931) states (19) that such gelatinous carcinomas as well as melanotic lesions are not curable by any known means. Broders, Buie and Laird (1940) and Norbury (1941) while allowing that colloid cancers are usually highly malignant are not as pessimistic over them as Miles. Dukes (1940) places all colloid or mucoid cancers in a separate and distinct group (11). All 5 of the patients in whom recurrence developed in this series had large fixed low lying lesions which had penetrated the fascia propria of the rectum presenting at the same time metastatic lymph nodes in the pelvic mesocolon. The first ampullary resections reported herein were done in 1942 in other words even the first patients in the group were done less than 3 years ago. The elapse of additional years obviously will be required before one can evaluate the factor of long term survival.

Gilchrist and David (1938) studying cleared specimens excised in the abdominoperineal operation for rectal carcinoma found metastatic lymph node in 68 per cent of the cases. Collier and his associates (1940) in 64 per cent and Gabriel and his associates (1935) observed lymph node metastases in 62 per cent of dissected specimens. Gilchrist and David concluded that large tumors may have no lymph

node metastases whereas small tumors may occasionally present evidence of extensive lymphatic spread. They point out further that when there is gross involvement of high lymph nodes there may be retrograde metastases to lymph nodes lying below the tumor.

Whereas Collier and his associates (1940) failed to find evidence of lateral lymphatic spread in lesions lying more than 3 centimeters above the anorectal line I am convinced from the experience with low lying fixed lesions that an operation which does not excise the levator muscles in juxtaposition to the bowel invites local recurrence. In the 5 instances reported herein in which local recurrence followed ampullary resection the local invasive qualities of the tumor may have been responsible. Yet I believe it would be safer to suggest that ampullary resection in such instances can be indicted on the score of failing to remove the lateral zone of lymphatic spread as well as in its failure to deal adequately with the item of local invasion. Miles (1931) states that the levator ani muscles are especially prone to invasion by cancer cells which have gained access to the extramural lymphatic system of the rectum (20).

The primary defect in the perineal operation for rectal cancer apart from the loss of sphincter function is that it fails to deal with the upward zone of spread. The potential defect in ampullary resection for rectal cancer is that when applied to unsuitable cases patients with large low lying lesions it fails to deal with the item of lateral lymphatic extension via the fascia overlying the levator muscles further it compromises somewhat on the extent of excision of the rectal wall distal to the lesion. From the standpoint of cure of rectal cancer obviously the abdominoperineal operation is the best procedure. In how many instances however would ampullary resection protect equally as well against recurrence and at the same time save the patient's sphincter? Many surgeons latterly are coming to the point of view in the management of cancer of the esophagus if esophagogastric or esophagojejunal anastomosis can not be effected that the patient should not be subjected to the alternative procedure of the Turrel operation with establishment of an external

fistula. An exteriorized esophagus is a severe handicap contrasted with the lesser troubles of a colostomy. Nevertheless it is perhaps not out of place to point out that surgeons can make but a poor imitation of the rectal sphincters which nature bountifully bestowed on us neither can one be bought at any price in any market open or dark.

A number of studies indicate that approximately 50 per cent of unselected patients subjected to the abdominoperineal operation survive 5 years without recurrence. Jones (15, 1929) 47.8 per cent. Lambertson and Dixon (—1934) 35.8 per cent (includes all operations for cancer of the rectum). Abel (1935) 38.3 per cent. Jones (16—1936) 52.6 per cent for the one stage and 51.3 per cent for the two stage abdominoperineal operation. It is reasonable to infer that the losses by death from recurrence of the malignant growth are sustained largely in the group exhibiting local invasion and lymph node metastases (Dukes group C). In other words even the best and most radical operation is inadequate for a large number of such cases. Dixon (1944) informs me that in a series of 100 patients with rectal cancer operated upon more than 5 years previously there were no 5 year survival among patients whose lesion fell into Dukes group C. Similarly in a small series also reported from the Mayo Clinic by Seefeld (1942) there were no 5 year survivals in patients whose lesions were placed in Broders' group IV. Among 191 patients whose excised lesions were classified in Dukes' group C Broder, Buie and Laird (1940) found only 14.6 per cent of 5 year survival and among 18 patients whose lesions were placed in Broder's group IV they observed only 11.1 per cent 5 year survivors. In this connection Mile (10—1935) the innovator of the abdominoperineal operation said concerning it: "Should it be reserved for advanced cases only as advocated by some then the invisible spread will have advanced beyond the confines of the operation field and recurrence will be inevitable (11). It would be difficult to justify any operation for cancer on the basis of accomplishment in the late case."

In this study Dukes (10—1935, 1940) well known scheme of classifying rectal tumor

has been employed. It is my impression that Dukes' scheme may not be as useful to the surgeon as it is to the pathologist for it implies that metastases do not occur unless local invasion has occurred. It would be more in keeping with surgical experience to indicate that any malignant tumor with or without local invasion beyond the confines of the rectum may be accompanied by lymph node metastases even though the incidence mounts sharply when the primary tumor exhibits definite evidence of local invasion.

HEPATIC METASTASES

The occurrence of hepatic metastases indicates definitely that vascular embolism of tumor cell occurs in malignancy. Coller and his associates (1940) noted evidence of direct local invasion of venous channel in 15 per cent of the rectal specimen studied.

Coincidental partial hepatectomy for direct extension of a malignant growth into the liver at the time of gastric resection for cancer has been described previously (35). A more protracted period of observation of the patients in which that procedure was carried out confirms the validity of the worthwhileness of such a maneuver. Because of the length of survival of many patients undergoing primary resection of the colon for cancer preventing hepatic metastases at the time of operation. I suggested previously that secondary excision of hepatic metastases reasonably might be undertaken in such case. It is only within the past year however that I have been able to persuade patient to undergo such secondary resection. If protracted followup in such patients should indicate that survival is no greater than in a similar group in which the metastases are left one might yet learn some thing of the manner of growth of hepatic metastase. My thesis is that if at the first operation the local lesion and the lymphatic drainage area can be excised satisfactorily secondary excision of the hepatic metastases 6 to 8 weeks later may cure the lesion. Failure to palpate metastase not near the surface in an organ as thick as the right lobe of the liver is admitted freely.

Hemostasis is not a difficult problem in excision of hepatic tissue. There is so much

fibrous tissue in the liver that bleeding may be controlled readily. The cautery is employed to remove the section of the liver involved. Large vessels are seized with hemostats as they are encountered and the vessels are ligated. In a deep wound the vessels in the liver substance can be distinguished readily by palpation that is the hepatic substance may be readily compressed between thumb and forefinger disrupting the tissue continuity leaving the vessel intact. Fibrin foam (Cohn) has been a helpful adjuvant agent in the control of parenchymatous oozing. When the vessels which traverse the defect in the liver are ligated however ordinarily the problem of hemostasis is not particularly difficult. The adjacent edges are sutured if possible with a running suture of catgut and the transverse mesocolon or other available omental structure is employed to sew over the defect with the thought in mind of localizing the inevitable temporary bile fistula. External drainage, therefore always provided and temporary external drainage of bile is usual.

During the past year three such secondary excisions of metastases have been undertaken. Two of these secondary partial hepatectomies were done for rectal malignancy in which an antecedent ampullary resection was done and one in a patient who developed a local recurrence following an exteriorization operation done elsewhere for a carcinoma of the pelvic colon. Six weeks after simultaneous removal of the colostomy the local recurrence in the abdominal wall and performance of primary anastomosis metastases were excised from both lobes of the liver (Fig 1 specimen C). In one of the rectal cases the metastasis was large and single involving the lateral portion of the right lobe of the liver. The gall bladder was freed and deflected to the left. The excised liver tissue weighed 335 grams (Fig 1 specimens A and B). These two patients continue well. In the other patient two metastases were present in the right lobe of the liver. This patient also had a large fixed inflammatory lesion that was removed with difficulty the Hochenig pull through operation being done. Supplemental colostomy became necessary because of fever and perirectal suppuration. A few weeks later the

colostomy was closed and the hepatic metastases were excised at the same time. The rectal function was quite satisfactory. A few months later however evidence of local recurrence became apparent. This patient died of local recurrence involving both ureters somewhat more than 10 months after ampullary resection. Two hepatic metastases were again present in the right lobe of the liver at autopsy. Whether these final hepatic metastases were the result of inadequate removal of the initial hepatic metastases failure to palpate occult subsurface metastases or failure to remove the local lesion completely cannot be determined.

AMPULLARY RESECTION COMBINED WITH REMOVAL OF METASTATIC LYMPH NODES PROXIMAL TO THE PELVIC MESOCOLON

Mention has already been made of instances in which resection of the whole colon and the greater portion of the rectum was made for ulcerative colitis. In a patient Mr. J. C. Univ. Hosp. No. 744810 aged 53 with carcinoma of the rectal ampulla presenting lymph node involvement proximal to the pelvic mesocolon following excision of these nodes and the inferior mesenteric artery at its site of origin from the aorta it became evident that the left colon was not adequately vascularized through the midcolic artery and the marginal branches of the left colic artery. In consequence it became necessary to mobilize the entire colon up to and including the hepatic flexure (Fig 1 specimen 7). The left half of the transverse colon was finally anastomosed to the rectum. If the transverse colon had not been so long it might have been necessary to anastomose the cecum to the rectum. This patient has satisfactory sphincteric function. In the earlier report it was indicated that the terminal ileum or the cecum had been anastomosed to the terminal pelvic colon in 7 patients without mortality.

INDICATIONS AND CONTRAINDICATIONS TO EMPLOYMENT OF AMPULLARY RESECTION

It is to be admitted freely that this operation cannot compete in all cases of rectal cancer with the abdominoperineal operation. It is immediately apparent that its employment is contraindicated in juxtaspincteric malignancy.

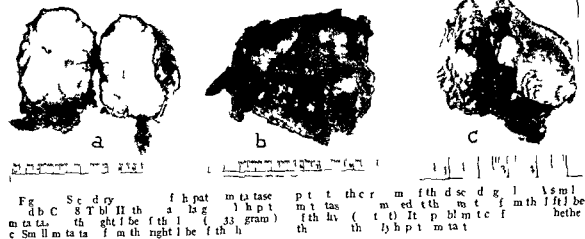


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nancies on the score of inadequate removal of the local lesion furthermore in all lesions at the level of the levator muscles the operation is contraindicated on the score that this procedure does not permit division of the levator muscles and adequate removal of the lateral zones of lymphatic spread

Hence in all large fixed ampullary lesions in which the tumor has extended beyond the confines of the fascia propria of the rectum and a real opportunity for spread into the lateral lymphatic zone exists ampullary resection should not be undertaken In other words in instances in which there is real hazard of local recurrence the abdominoperineal operation should be favored over ampullary resection Apart from these considerations the operation of ampullary rectal resection described herein would appear to deal as well with the problem of rectal cancer as does the abdominoperineal operation The avenues for upward lymphatic extension of malignant growth into the pelvic mesocolon can be dealt with equally as well by the operation of ampullary resection as by the abdominoperineal operation

DISCUSSION

The following are the items which concern both patient and surgeon in this and any other operation for malignancy (1) operative mortality (2) possible complications of operation (3) prospects of ultimate cure (4) function

Preservation of sphincteric function is the special consideration which compels interest

in ampullary resection The operation appeals at once to the patient The thought of a colostomy is ordinarily abhorrent and frequently revolting to a patient Mere mention of a possibility of saving the sphincters immediately arrests the patient's interest There are patients who will not accept a colostomy There were a few such patients in this group Yet 2 such patients when evidence of local recurrence developed following ampullary resection for fixed circumferential lesion will inly accepted colostomy and subsequent efforts directed at extirpating the recurrence All surgeons have had experience with patients who will not submit to operation if told they have cancer Obviously they are unreasonable but this type of mania sometimes defies being set aside An operation which must be defended on the thesis that it may be a satisfactory substitute for patients who are more interested in preservation of function than in cure is obviously not a good operation for cancer

There are patients for whom a colostomy is a heavy and tragic burden The majority of reasonable patients however learn to deal with the situation and tolerate colostomy without complaint It is probably fair to say however that it is far easier to advise acceptance of colostomy than it is for the patient to resign himself to it Only once has a patient hunted and threatened me with a gun That patient had a colostomy performed in this clinic because of acute obstruction caused by

an irremovable malignant lesion in the left colon. He demanded that the colostomy be closed. I thought he was unreasonable; he thought we were because we failed to comply with his wishes.

It is to be admitted that postoperative complications are more frequent in patients undergoing ampullary resection than in those accepting the abdominoperineal operation. A defect in the suture line with a temporary retrorectal fistula is a rather common complication. The length of the postoperative hospital stay in this group of patients has been long made so essentially by necessity for supplemental colostomy in a number of the patients. In the earlier series reported the average postoperative hospital stay for primary resection of the colon and rectosigmoid was 14.3 days. That figure has not been computed for the 78 colon resections reported herein but it is undoubtedly shorter because the majority of patients having resections of the colon through oblique or transverse incision are now leaving hospital before the tenth postoperative day. A trying complication in a few instances of ampullary resection has been a rectovaginal fistula in the female. I have the impression, however, that more frequent coincident excision of the uterus and the upper portion of the vagina in the instance of adherent tumors will eliminate this hazard. Under no circumstances should drainage be established through the vagina in ampullary rectal resection.

Despite the complication of a temporary retrorectal fistula which has been dealt with in the majority of more recent cases solely by provision for perineal drainage just anterior to the coccyx. I have the impression that ampullary resection can be done at risks not far out of line with those run by patients undergoing the abdominoperineal operation.

Time will indicate whether the ultimate results of this operation evaluated on the score of 5 year or longer period of survival without evidence of recurrence are as good in properly selected cases as in the more radical abdominoperineal operation. That the abdominoperineal operation is a better procedure for low lying lesions and particularly in large fixed circumferential low lying lesions in which the

opportunity for lateral lymphatic spread of the tumor is great already has been admitted.

Perhaps in no type of cancer would effort at instruction of the public in the early recognition of the symptoms of rectal cancer prove more helpful. Were it not for the confusion of bleeding hemorrhoid every patient with rectal bleeding should come for examination to have the diagnosis of rectal cancer disproved. Much more can still be done to instruct the public on this score. Granted early diagnosis a far larger number of patients could have ampullary resection with sphincter preservation rather than the abdominoperineal operation and colostomy. In a study of 1401 cases of cancer of the rectum and rectosigmoid Bacon (1938) in reviewing the location of 1401 carcinoma in the pelvic colon and rectum stated the distribution to be as follows: sigmoid 25 per cent, rectosigmoid 16.5 per cent, rectum 56.1 per cent, and anal canal 4.9 per cent. Only 19.1 per cent of these 1401 neoplasms were less than 1 inch from the anorectal line. Dividing the rectum into three parts of which the lowest is the shortest and the upper the longest portion Duke (1940) found in a group of 913 rectal cancers 56.6 per cent in the lower third, 36 per cent in the middle, and 30.8 per cent in the upper third. Inasmuch as ampullary resection can be carried out in the midrectum quite regularly and as low as centimeters from the anus in suitable instance particularly in thin women with a deep cul de sac in instance of rectal carcinoma diagnosed early the method would appear to have a wide range of applicability. In the clinic ampullary resection has reduced materially the number of abdominoperineal operations; however, it has been indicated we already have learned that the method has no place in low lying lesions in juxtaposition to the lateres and particularly in large fixed low lying lesions.

COMBINED BARIUM AND PROCTO SCOPIC EXAMINATION

An item not to be forgotten in all colonic and rectal operations for malignant growths is that excision of an extra segment of bowel occasionally brings with it an unexpected polyp. In the clinic therefore all patients in

whom cancer of the colon is diagnosed by the roentgenologists undergo proctoscopic examination prior to operation. Similarly all patients in whom cancer of the rectum is diagnosed by the proctologist receive a barium enema to exclude the possibility of another malignant tumor or a polyp more proximally situated. All lesions within the reach of the sigmoidoscope also are subjected to diagnostic biopsy before operation is undertaken. Mayo and Schlicke (1942) stated that in 100 consecutive autopsies on patients between 22 and 80 years (average 54.7 years) dying of conditions unrelated to the colon polyps were found 16 times and in 8 of these beginning cancerous changes were present.

SUMMARY

Primary resection employing the closed anastomosis without antecedent complementary or supplemental colostomy is used in this clinic as the operation of choice in all unobstructed malignant growths of the colon. Similarly in suitable lesions in the ampulla of the rectum primary resection (closed anastomosis) can be carried out satisfactorily. Whereas primary healing and in consequence short postoperative hospital stays are the rule in primary resection of the colon and recto sigmoid in ampullary rectal resection primary healing is not usual. This circumstance is owing to the sole dependence of the surviving lower rectal segment upon the inferior hemorrhoidal arteries following division of the superior and middle hemorrhoidal vessels and mobilization of the rectum which ordinarily deprives the lower rectal segment of the branches coming from the middle sacral artery. It will nevertheless ampullary rectal resection with primary anastomosis usually can be done without colostomy provision being made for perineal drainage of the presacral space which may become infected because of a defect in the suture line. Supplemental colostomy however has been necessary in several instances to deal quickly and more effectively with the item of posterior space infection.

The chief defect in the operation of ampullary resection is that it is not a good operation for large fixed low lying Dukes group C malignant growths. Whereas the tumor can

be mobilized and a satisfactory anastomosis made even in such cases the opportunity for local recurrence is great in that the operation does not remove the levator muscles and the lateral zones of lymphatic spread. In suitable small low lying lesions and in most lesions of the upper rectum this experience with rectal resection suggests that it is a satisfactory operation for cancer. Ampullary resection also has been done for ulcerative colitis.

Sphincteric function in most cases has been good after ampullary resection. The primary closed suture method appears to be the most satisfactory operation.

The hospital mortality for primary resection of the colon and rectosigmoid has been 5 per cent and for ampullary rectal resection 7.4 per cent.

Secondary excision of hepatic metastases is described.

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METABOLIC ALTERATIONS FOLLOWING THERMAL BURNS

II Changes in the Plasma Volume and Plasma Protein in the Convalescent Phase

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THE purpose of this paper is to present the alterations that occurred in the plasma volume the available (thiocyanate) fluid volumes the total circulating plasma protein the total circulating albumin and the hematocrit value of burned dogs during the convalescent period. It has been shown (8, 16) that during the first 36 to 48 hours after burning there is a diminution in the plasma volume. Because of this diminution and because of the questionable accuracy of plasma volume determinations during shock the present studies were confined to animals that had fully recovered from the immediate shock phase.

MATERIALS AND METHODS

Normal adult female mongrel dogs were employed. The dietary management and the preparation of the animals are described in another publication (4). (Animal 7 and 8 were simultaneously employed in both studies.) Control blood studies were obtained after the animals had been maintained on a constant diet for 3 to 4 weeks. Following the burn all of the animals except dog 9 were able to continue on the same diet.

All blood samples were obtained in the morning after a 12 to 18 hour fast. Heparin was used as the anticoagulant. Undue stasis was avoided and greased syringes were employed to prevent hemolysis. Hematocrits were done in duplicate in Sanford Magath (7) cell volume tubes the total plasma protein concentration was done in duplicate by the micro Kjeldahl technique. Plasma albumin concentration was determined by the method of

Hill and Trevarrow except that five times the amount of plasma and globulin precipitant was employed.

The plasma volume and available (thiocyanate) fluid volume were determined by injecting simultaneously 868 milligrams of Evans blue dye (T 1824) and 483 milligrams of sodium thiocyanate¹ according to the direct method of Gregersen and Stewart as adapted to the photoelectric colorimeter by Gibson and Evelyn. The disappearance slope of the Evans blue dye was determined by four points and was found to vary only slightly during the control or postburn studies.

The total circulating plasma protein and plasma albumin were calculated by multiplying the plasma volume by the plasma protein and the albumin concentrations per cubic centimeter respectively. The total blood volume was calculated from the following formula:

$$\text{Blood volume} = \frac{\text{Plasma volume}}{\text{concentration}} \times \infty$$

Since it is generally appreciated that the true blood volume cannot be determined in this manner (14) no absolute conclusions will be based on these findings but it was thought that the percentage changes might be of some interest because of the alterations that occurred in the plasma volume and in the hematocrit.

A few days after the control blood studies had been obtained the animals were burned under intravenous nembutal anesthesia. They were burned over the thorax and abdomen which had previously been shaved. Burns with a burning area of 12.57 square centimeters were employed being heated in boiling water. The animals were then placed in a cage and the following studies were made:

hydration Shen Ham and Fleming have shown that anemia is present in the convalescent phase of burns because of an accelerated breakdown of red cells due to an increased fragility

Our data also show a definite diminution in the red cell mass. Whether this is entirely due to an increased breakdown of red cells or in part a result of the crowding out of red blood cells by the increased plasma volume is not definitely known. Conversely we are unable to say whether the increase in the plasma volume is due to an attempt to compensate for the decrease in red cells or whether it is caused in part by retention of fluid and electrolyte. Peters and Van Slyke and Warren Merrill and Stead have stated that often a compensatory rise in the plasma volume occurs when anemia is present but since there is disagreement on this point (3) the anemia seen in our burned animals may not be the sole explanation for the rise in the plasma volume.

Although the plasma volume was increased in most instances there was interestingly a decrease in the total circulating plasma albumin which accounts for the major osmotic pressure of the protein fraction. Cope recently stated that an increased plasma volume apparently occurs 4 to 5 days after a burn and intimates that this may be due to the reabsorption of previously lost protein. That the rise in plasma volume is not due solely to the reabsorbed protein seems likely. In dog 9 the amount of total circulating protein and albumin was markedly increased when the volume showed a precipitous fall. Also the fact that the rise in the plasma volume persists for weeks makes this theory unlikely. Thus the increase in the plasma volume must be largely due to a retention of either water or electrolytes or both.

Because of the findings in the present study and because of the increasing tendency to employ electrolyte solutions in the treatment of shock (2, 11, 5) it seems worth reconsidering the factors that influence the size of the plasma volume. In the normal individual it has been shown (17, 18) that the osmotic effect of the protein fraction is extremely important. The osmotic pressure exerted by the proteins especially albumin is largely responsible for the

reabsorption of water into the vascular system. In the healthy subject the protein is almost entirely confined to the vascular bed and to the intracellular space and there is approximate osmotic equality of the electrolytes within the cell, the interstitial space and the plasma. Thus a slightly higher solute concentration within the plasma and intracellular phase is maintained because of the presence of the protein molecules. It should be remembered however that the electrolytes are present in much greater amounts than protein and since the amount of water present in the body compartments is dependent on the total solute concentration (colloid and electrolytes) the electrolytes are much more important than are the colloid in determining the total amount of body water (20). In fact it has been stated by Van Slyke that the osmotic effect of the protein molecules is so slight when one is considering total body water that it can be almost neglected. It seems probable therefore that the alterations noted during the convalescent phase of these burned animals is largely governed by the fluid and electrolyte disturbances.

From other experiments (22, 32, 33) it is also evident that the size of the plasma volume in the diseased state is often not dependent on the plasma protein concentration. It should be recalled that the intraperitoneal injection of a solution of 5 per cent dextrose into normal dogs with the withdrawal of the same amount of fluid 4 hours later produces a marked increase in the plasma protein concentration but this even in the face of an adequate water and caloric intake will not restore the plasma volume if sufficient electrolyte are not present (2).

The importance of sodium was recently emphasized by Fine, Frank and Seligman who showed that the intravenous administration of a 1 per cent solution of albumin into an animal suffering from tourniquet shock was not of benefit unless a physiologic solution of sodium chloride was given by stomach tube or intravenously.

The work of Warren, Merrill and Stead (3) has also shown that a normal plasma volume may be obtained in shocked animals even when the protein concentration and total

circulating plasma protein is markedly diminished by increasing the extracellular fluid volume (tissue tension). Thus it is evident that the size of the plasma volume in disease is not dependent on the protein concentration alone but is governed by the following factors (1) the total solute concentration of the extracellular fluid volume and the available water (2) the osmotic pressure of the plasma minus the osmotic pressure of the interstitial fluid and (3) the blood filtration pressure minus tissue tension. Collier, Campbell, Vaughan, Job, and Moyer have pointed out that at certain times the kidneys are unable to excrete electrolytes and water in normal amounts and that the inability to excrete such products may lead to a marked retention of body fluid when the circulatory mechanisms aforementioned are not grossly abnormal.

Studies by Davidson on patients with severe burns showed that chloride was excreted in only small amounts. McIver re-emphasized this fact after having administered large amounts of a physiologic solution of sodium chloride. Trusler, Egbert, and Williams stressed the undesirable effects of large volumes of water in burned patients and experimentally were able to produce water intoxication by excessive administration. It has also been shown that a fall in the extracellular sodium concentration (9.23) causes an intracellular shift of water and since this condition and acidosis often exist during the shock and convalescent phases of a severe burn, it would not seem desirable to give large quantities of water nor a physiological solution of sodium chloride. Solutions with an electrolyte make up similar to that of plasma that would not upset the body's normal electrolyte pattern and would combat alterations in the acid-base balance would thus appear to be desirable during the period of shock. In the immediate postshock phase it would then seem advisable to give solutions and food that would have the mineral and food value needed especially for cellular repair and that at the same time would gradually help rid the body of any excess water.

CONCLUSIONS

1. Following the shock phase, burned animals that were maintained on an intake of

food identical with that consumed before injury show a decided rise in their plasma volumes above the normal.

2. Since a state of overhydration is manifested during the convalescent phase by the increase in the plasma volume and available (thiocyanate) fluid volume per kilogram of body weight, it does not seem advisable to give excessive quantities of fluid during the postshock period. Such an overaccumulation of fluid may undoubtedly lead to some of the so-called toxic deaths. Adequate urinary output should be maintained and diuresis encouraged.

3. A marked increase in the total circulating plasma proteins was present although a marked negative nitrogen balance existed for 2 to 3 weeks.

4. A moderate decrease in the plasma albumin concentration and in the total circulating albumin occurred when the plasma volume increased.

5. A definite anemia was present in the convalescent phase because of an actual decrease in the circulating red cell mass.

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were in the patients with the most deficient proteins. They found that high caloric intake if low in protein had no effect on the healing of bed sores; there was continual weight loss and nitrogen balance remained negative. On the other hand a high protein diet resulted in a positive nitrogen balance and rapid healing of the ulcer. At this time I had a patient with a decubitus ulcer 4 centimeters in diameter which was enlarging in spite of very good nursing care. This man was then placed on a high protein diet (100 to 150 gm. protein per day) and in 12 days the ulcer was healed.

Distention and gas pains may be prevented or greatly lessened by the administration of adequate protein. In 1937 McCray Barden and Ravdin experimenting on animals noted that as serum proteins decreased in concentration gastric emptying time was delayed. Ravdin found that with marked hypoproteinemia it took three times as long for the food to pass through the stomach and the small bowel.

An important function of the plasma proteins especially of the albumin is to control the balance of fluid between the capillaries and the tissue spaces. While the figures are variable and depend somewhat upon other factors in general edema is likely to appear when the plasma proteins are below 5.5 grams per 100 cubic centimeters or the albumin is below 3 grams per 100 cubic centimeters.

The globulin factor aid in the resistance to infection. Cannon Chase and Wissler (5) in 1943 demonstrated that the production of antibodies is only one fifth to one third as great in animals with protein deficits as it is when the proteins are normal. Cannon and Wissler with Woolridge and Benditt (6) found that normal human serum contains about 25 milligrams per 100 cubic centimeters of globulin of this 8 milligrams or one third may be gamma globulin and it is in this one third that antibodies are found.

Our study is based upon the use of protein digest (amigen) in 203 surgical patients from my private practice in the first 6 months of 1944. At two hospital amigen was given intravenously to most of the patients until they were able to take a soft diet by mouth. In another hospital I used no amigen but used

glucose and physiological saline instead as a control.

The eating habits of normal man are well established. He eats three meals a day and does not wait until he feels exhausted before consuming the next meal. It is no more logical to go several days after operation without adequate nourishment. It is even more hazardous since there is loss of blood and marked excessive breakdown of protein in the traumatized tissues. The postoperative lassitude and weakness have been attributed to the operation however may not the lack of nourishment be an important factor?

In a series of 32 appendectomy patients without peritonitis we gave amigen once or twice on the day of operation. The next day they were placed on soft diets. An average of 1328 cubic centimeter of amigen and 62 cubic centimeters of other intravenous fluids were given each patient. Forty three liters of amigen were administered and 5 per cent of these caused reactions in 2 patients. One was a patient with acute appendicitis and severe nephrosis. The preoperative pulse was 160, marked anasarca and plasma protein was only 2.59 grams per 100 cubic centimeters. After the second infusion of amigen she was nauseated and vomited; this may have been due to the disease. She died of nephrosis 5 hours after operation. The other reaction was nausea without vomiting after the first infusion. There was no reaction after the second infusion. Routinely these patients sit up in 3 days and are dismissed in 5 days. They exhibit very little weakness.

Twenty six hemorrhaphy patients were given an average of 038 cubic centimeters of amigen and of the 55 liters infused there was a distressing reaction in 2 per cent. One patient had nausea after the first of two infusions which was probably not due to the infusion as she was nauseated at different intervals during the same day.

An average of 365 cubic centimeters of amigen and 576 cubic centimeters of other intravenous fluid were given to 28 cholecystectomy patients. In a total of 61 liters of amigen there was a reaction to 4 per cent. One liter of amigen is given twice a day until nausea has ceased and the patient is ready to take a soft

diet. These patients are much stronger and are convalescing much more rapidly. Most of them now sit up in 5 days and return home in 7. Of the 3 reactions there was a general malaise in a nervous patient in which the infusion was given in 2 hours and 30 minutes. Two had nausea. In the first it was given too rapidly, 2 hours and 20 minutes; the other probably was not due to the amigen as she was developing symptoms of a bowel obstruction for which she was again subjected to operation.

The pelvic operation group were treated the same as those with cholecystectomies and the results were similar. An average of 2,995 cubic centimeters of amigen, 139 cubic centimeters of blood and plasma and 65 cubic centimeters of other intravenous fluid were given to each patient. Of the 144 liters of amigen given there were distressing reactions in but 4 per cent. There were 5 reactions of nausea and 1 of headache and dizziness. Four of the six reactions were due to too rapid an administration of amigen, 1 hour and 50 minutes to 2 hours and 30 minutes. These were all reactions to infusions given in the early part of this study. None had reactions with each infusion of amigen. One had reactions with one of the infusions received and the others in only one.

In a group of 17 thyroidectomy patients an average of 2,117 cubic centimeters of amigen and 164 cubic centimeters of other intravenous fluid were given. Of the 36 liters of amigen infused there were distressing reactions to 11 per cent. Two patients reported nausea and one patient had emesis after two separate infusions. These patients were all rather thyrotoxic.

Fifteen mastectomy patients were given an average of 1,666 cubic centimeters of amigen and 66 cubic centimeters of other intravenous fluid. Distressing reactions were reported after the use of 5 per cent of the 19 liters of amigen. Dizziness was reported by 1 patient; it was not given too rapidly and the patient was not otherwise distressed. These patients were placed on a soft diet within a short time after operation.

In a group consisting of 3 exploratory celiotomies, 2 liberations of adhesions, 1 gastroenterostomy, 2 leg amputations, 1 Kondoleon

operation for elephantiasis, an average of 22 cubic centimeters of amigen was given preoperatively to each patient. Postoperatively they received an average of 4,555 cubic centimeters of amigen, 22 cubic centimeters of blood and 777 cubic centimeters of other intravenous fluid. Of the exploratory celiotomies one was an inoperable carcinoma of the gall bladder, another carcinoma of the rectosigmoid and the third carcinoma of the ovary with liver metastases. There were 2 deaths in this group: the carcinoma of the gall bladder and 1 of the leg amputations. In spite of an average of 5 infusions per patient there were no reactions in this group.

In the following four series the favorable results of protein digest intravenously were quite marked because a longer time elapsed before the patients were able to resume eating. They were given amigen 1 liter twice a day until it was safe to begin mouth feedings. Their maintenance of strength and well being was outstanding and they did not develop edema. There was no need to give food by mouth until peritonitis had subsided and until bowel resections had quite healed.

In a group of 7 patients with peritonitis we gave an average of 6,326 cubic centimeters of amigen, 228 cubic centimeters of blood, 114 cubic centimeters of plasma and 1,259 cubic centimeters of other intravenous fluid. Protein is especially indicated in peritonitis as there is considerable protein loss into the peritoneal exudate. In spite of the severity of illness in these patients only two had reactions: one was an 11 year old boy who suffered chills but no fever and the other a reaction following the fifth of six infusions. This infusion was given too rapidly; we later discovered 2 hours and 30 minutes to be too short a period for satisfactory infusion. Of the 45 liters given there were distressing reactions to 4 per cent.

In acute intestinal obstruction amigen is usually given preoperatively as well as after surgery. Three patients with acute intestinal obstruction were given preoperatively an average of 2,333 cubic centimeters of amigen and 5166 cubic centimeters of other intravenous fluid and postoperatively 8,666 cubic centimeters of amigen and 666 cubic centimeters of other intravenous fluid. Thirty three

liters were administered and there was distressing reaction in 3 per cent. One patient reported having a reaction of bad taste, nausea and emesis after an infusion. It is doubtful if it was due to the amigen as she was a very ill patient.

Ten patients upon whom gastric resections were done mainly for carcinomas and benign ulcers were given an average of 3,300 cubic centimeters of amigen, 50 cubic centimeters of blood and 1,400 cubic centimeters of other intravenous fluid preoperatively. Postoperatively they received 10,000 cubic centimeters of amigen, 150 cubic centimeters of blood and 1,200 cubic centimeters of other intravenous fluid. There were no reactions to any of the infusions in this group. About one half of the patients with carcinomas are hypoproteinemic as judged by the reports of Karl Meyer Memorial Hospital in New York (23) and the Brooklyn Cancer Institute ().

CANCER PATIENTS

TOTAL BLOOD PROTEINS—G PER 100 CC

N		Amigen	Reported	Percentage below normal (5)
	Miles	6—6	—8	
100	Brooklyn Cancer Institute	6—8	—9	5
100	Abel	—6	8	
	Ould	5—7	6	
8	G	5—8	8	7

Therefore we correct anemia by blood transfusion and protein deficiency by protein orally or intravenously before operation. This group progressed remarkably well with scarcely any complaints of weakness.

The colostomy group of 8 patients were mainly for carcinoma. It included obstructive resections of the sigmoid. In these the clamp is left on for 4 or 5 days until the risk of severe infection of the wound is reduced to a minimum. Preoperatively they were given an average of 6 cubic centimeters of blood and 50 cubic centimeters of other intravenous fluid postoperatively each received 10,000 cubic centimeters of amigen, 1105 cubic centimeters of blood and 131 cubic centimeters

of other intravenous fluid. Eighty liters were administered with no distressing reaction. The patients' strength remained good and with gastric suction there was practically no distention.

In giving 730 liters of amigen intravenously to 203 surgical patients there were no severe reactions. Most of the reactions reported were in the early part of this study, 16 per cent occurring in the first 5 months when many of the infusions were given too rapidly. However there were reactions to only 3 per cent of the 730 infusions. If a 3 hour period is allowed for an infusion of 1000 cubic centimeters of amigen we have little to fear from reactions.

A group of 50 patients were used as a control group during the time that we were making an investigation of the use of protein digest intravenously. They received glucose and physiological saline instead of amigen. They seemed to be weaker and slower in convalescing than those given protein digest.

It is realized that the conclusions drawn are based upon clinical impressions alone. Plasma protein determinations have been of no avail since definite changes do not occur within a span of a few days; consequently they are of value only in chronic deficits. Unfortunately there is no method of measuring the tissue protein and this is approximately thirty times as much as the plasma protein. Except for research purposes it is impractical to determine the total plasma volume roughly it is about one twentieth of the body weight. Therefore in an average 70 kilo gram man there is 1/20 of 70 kilograms or 3,500 grams of plasma. Plasma protein is normally 6.5 to 7.5 grams per 100 cubic centimeters. Taking an average of 7 per cent the total serum plasma is .07 times 3,500 grams which equals 245 grams. The total plasma volume is variable. For example it is greatly reduced in dehydration or shock and in such a state the total protein determination on per 100 cubic centimeters may be considerably elevated but because of the decreased plasma volume the plasma protein in the total amount of blood may be decreased. It is possible to get an estimate of plasma volume by determining the erythrocyte count, hemoglobin and the specific gravity of the urine.

For a serum drop of 1 gram per 100 cubic centimeters the total drop in the plasma is approximately 35 grams. But as there is thirty times as much protein in the tissues we must assume that the protein loss from the body would be 30 times 35 grams or 1150 grams. This drop would require 2 or 3 weeks if no protein at all were given. It is evident why it requires so much protein to return a patient with a chronic deficit to normal.

CONCLUSIONS

The use of protein digest intravenously has been proved by various investigators to be safe and efficacious in promoting general well being and strength and as an invaluable aid in tissue building wound healing combating infection maintaining fluid balance osmotic pressure and optimal gastric emptying.

In our use of intravenous protein digest in 203 patients we found these results to be true we endorse its safety as a therapeutic measure. We advocate the intravenous use of protein digest following major surgery as a routine measure until such time as patients are able to take adequate nourishment by mouth or until proper assimilation is assured.

Our patients are clinically improved they are stronger display more pleasant cheerful attitudes and are able to be about sooner than those who are not given this treatment. They have a quicker return of appetite are more vigorous and ambitious in assuming accustomed activity and show much less fatigue.

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DISARTICULATION OF THE INNOMINATE BONE FOR MALIGNANT TUMORS OF THE PELVIC PARIETES AND UPPER THIGH

EVERETT D SUGARBAKER MD FACS d LAUREN V ACKERMAN MD
C l m b j M u

THE operative removal of varying portions of the pelvis along with the subjacent lower extremity has now been occasionally practiced for approximately 50 years. Though a number of terms (interilioabdominal amputation, interilioabdominal disarticulation, interpelviabdominal amputation, interpelviabdominal disarticulation, interiliosacropubic disarticulation, hindquarter amputation, hemipelvectomy, transiliac amputation) have been applied to operations of this general character, we have chosen the simple descriptive above because it most closely fits the cases to be presented and constitutes what in our opinion is the ideal procedure in the majority of instances.

The first attempt to accomplish such a removal is generally credited to Billroth, who in 1891 undertook to treat a sarcoma of the pelvis by this means. His patient died several hours postoperatively. Several other unsuccessful tries by Jaboulay and by Cacciopoli then followed, but in 1893 Girard resected a sarcoma of the upper femur carrying his line of division well up into the pelvis and was able to keep his patient alive postoperatively. A year earlier he had successfully removed a portion of the pelvis in another patient, but this was done for a stump recurrence of a sarcoma of the upper femur following an earlier hip joint disarticulation. Since then an increasing number of reports have been collected from time to time by various authors (1-18). In the most recent of these, Leighton collected 106 cases. The addition of 6 more, inclusive of the authors' cases, brings the total to 113. Of this group, 99 have been operated on for tumors of bone or soft parts in the region of the upper femur or pelvis

and it is with these that the present writing is concerned.

In evaluating any operative procedure for malignant neoplasms, two primary factors must always be taken into consideration: the primary operative mortality and the ability of the operation to cure. The factor of disability should also be considered in any operation as mutilating as this one, for there is no doubt that the disability is considerable. To date, no satisfactory prosthesis has been designed which will enable these patients to walk, and ambulation must be accomplished with the help of crutches.

Of the 99 cases listed, death occurred in 38 at the time of operation, a mortality rate of 38 per cent, and although the cause of death has not always been stated, it seems apparent that shock was responsible for the great majority, since death usually ensued either during or within a few hours of operation. With newer methods of treating this surgical complication, the mortality rate has dropped considerably. Prior to 1935, death occurred in 56 per cent of the recorded cases in the postoperative period, but in the past 10 years there have been only 6 postoperative deaths in the 41 patients operated upon, a mortality of 14 per cent. The average age of the group surviving operation was 35 years, as compared to 40 years in the group which succumbed, an additional reflection of shock as the major complication.

Attempt to evaluate the end results have been somewhat discouraging, as the length of follow-up in many instances has been inadequate to draw any useful conclusions. Of 61 patients surviving operation and followed up, 0 died of disease in 1 year, 2 up to 2 years, 1 each up to 3 and 5 to 6 years. Nine were clinically well up to 1 year, 6 up to 2 years,

2 up to 3 years and 4 from 5 to 9 years. Sixteen were not followed at all. Unfortunately of the 21 patients who were reported clinically well we do not know how many later died of disease though it is apparent that most of these patients died of disease within 1 year of operation and 12 of the patients had survived that period.

A variety of tumors were found in the 45 patients who were followed. There were 39 with tumors of the bone, 5 of the soft parts and 1 metastatic carcinoma (thyroid) who was alive 1 to 5 years later. Of the tumors of bone there were 15 osteogenic sarcomas, 2 of the patients living 1 to 5 years, 1 each of the osteoblastic and osteolytic types, periosteal chondrosarcomas 3 living 1 to 5 years and 4 dead within the 5 year period, 1 chondroma, 1 a postoperative recurrence and all living 1 to 5 years, 1 each of Ewing's sarcoma, benign giant cell tumor and neuroblastoma, each of the 2 latter living 1 to 5 years. Of the tumors of the soft parts, 3 were of muscle origin and 2 of these were well 1 to 5 years, 1 extraosseous osteogenic 1 unidentified. It is interesting to note that 2 of the 19 osteogenic sarcomas were living. Undoubtedly the most favorable group consists of those in which the primary site of origin is in cartilage. It was difficult in some instances to determine accurately the existing pathology and the classification occasionally had to be made on the basis of inadequate data.

ANATOMICAL STRUCTURES CONCERNED

In severing one side of the pelvis the following structures must be divided: skin muscles—(1) flat muscles of the anterior abdominal wall, (2) rectus abdominis, (3) ischio cavernosus, (4) quadratus lumborum, (5) iliopsoas, (6) gluteus maximus (sometimes saved), (7) pyriformis, (8) levator ani ligaments—(1) iliofemoral, (2) sacrospinous, (3) sacrotuberous vessels—external iliac artery and vein, deep epigastric, gluteal (unless the gluteus maximus muscle is to be spared), pudendal nerves—branches of lumbar plexus bone—symphysis pubis (or opposite pubic arch), sacroiliac joint (or sacral ala).

Structures to be carefully guarded are (1) ureter, (2) bladder, (3) rectum.

PROCEDURE

Our experience has been confined to the use of continual spinal anesthesia (5). The needle is placed in the third lumbar interspace and is included with the lower portion of the novocain tubing in the operative field so that it may be more closely guarded or replaced if necessary. Anesthesia is maintained at the level of the umbilicus. Transfusion is carried out throughout the entire procedure into the opposite upper extremity and small doses of pentothal are periodically given as needed to maintain light sleep. The patient is placed in an oblique position on the table and bolstered with sand bags. This position permits sufficient mobility for easy exposure both anteriorly and posteriorly.

An incision is made from the posterior superior iliac spine to the symphysis ending just above the iliac crest and Poupart's ligament. This incision gives access to the entire iliac fossa and vessels. The peritoneum is stripped away or the peritoneal cavity is entered if desired that it be left on the tumor or if for individual reasons it seems necessary to explore the peritoneal cavity at this point.

The external iliac vessels are next identified and the artery is securely ligated about 1.5 centimeters below the internal iliac. The leg is then elevated for several minutes in order to recover some of the blood contained in it following which the vein is ligated. The deep epigastric vessels are ligated and the pubic attachment of the rectus abdominis muscle is divided. The bladder is stripped away from the pubis, the penis is retracted toward the opposite side and the symphysis is divided either with a knife or by passing a Gigli saw behind it and cutting from within outward. The pubic attachment of the ischio cavernosus muscle is divided close to the bone. Severe bleeding from the periprostatic and perirethral venous plexus may be encountered at this point. Exposure is usually inadequate at this point and the bleeding is best controlled by sponge packing until the specimen has been removed.

The skin incision is then continued from the posterior superior iliac spine in a downward lateral direction. The flap will be adequate if



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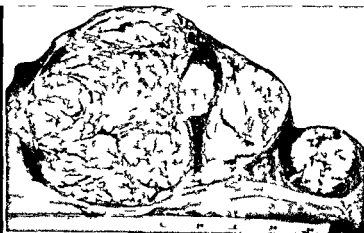


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The differential diagnosis between a lipo
sarcoma and a metastatic adenocarcinoma of
bone originating in the kidney is at time dif
ficu t although liposarcomas rarely metasta



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Fig G ph t raph f k i y h m ll 2
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size to the regional lymph nodes. Microscopically they both may reveal large amounts of sudanophilic fat and glycogen. If multiple sections of the metastatic focus are taken and there are no papillary or glandular structures as in our case the diagnosis is obscure. The primary kidney tumor may be so small as in this instance that pyelograms cannot determine the diagnosis. The most important finding in the microscopic appearance is the character of the individual cell. In the renal cell carcinoma the nuclei are centrally located with well defined outlines and rather foamy vacuolated cytoplasm (Fig 11a). Liposarcomas on the other hand invariably have some cells with eccentric nuclei which are compressed to a crescentic shape by the fat filled cytoplasm (Fig 11b). The absence of the cell in this case plus the involved regional lymph nodes should have determined the biopsy diagnosis.

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In 28 cases of multiple exosto es reported by Lichtenstein 3 developed malignant change. He feels that probably the number of cases would have been higher if more time had been allowed to elapse. According to Lichtenstein s histologic criteria our case should be classified as questionably malignant. However if one takes into consideration the gross appearance the clinical course and the fact that other cases have been known to develop distant metastases then a diagnosis of chondrosarcoma is justified. The peripheral chondro sarcoma has a much better prognosis than the one arising centrally. It tends to grow slowly remain localized for a long period of time recur if inadequately removed and finally to metastazize through the blood stream (23). The metastases are often only extension of the tumor into the large veins and have been known to pread all the way from the femoral vein to the pulmonary artery (17 30).

This case has been classified by some as multiple cartilaginous exostoses but is probably best designated as chondrodysplasia. The fundamental cause lies in the proliferation



Fig

F 3



Fig 4

F 5

F

F

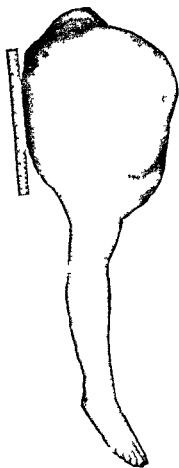


Fig 6

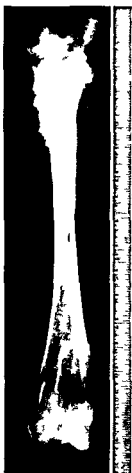


Fig 7



Fig 8



a



b

Fig 19

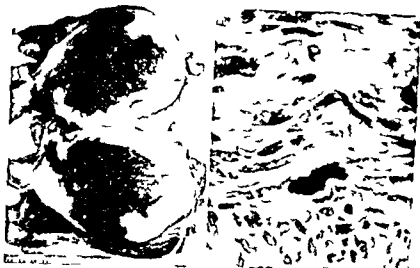


Fig. 1. C. S. I. ft. G. os. ph. t. gr. ph. of t. m. d. mo. t. u. ge. tral. h. m. rh. ge. a. d. p. c. h. l. l. l. t. m. b. Ph. tom. raph. (h. h. po.) \ t. gi. tt. m. ll.

and ossification of bone forming cartilage. It is hereditary in nature, the proliferation and ossification of intermediate cartilage occurring during the period of skeletal growth (6-7-16).

This patient has gained 30 pounds since operation and is in excellent general health and is able to use her crutches very well (Fig. 2). A prosthesis may be made. In view of the pathology and wide excision the prognosis appears excellent although it is possible that

malignant changes may develop in one of the other lesions.

CASE 5. W. H. L. EFSCH No. 6. St. Th. p. t. e. t. a. 58. yea. ld. m. l. as. dm. t. t. th. h. p. tal. Ap. 12. 944. P. th. ht. g. p. t. ll. l. ed. by. ll. u. f. th. th. h. on. the. h. p. as. h. st. n. t. e. d. 6. ls. b. f. The. as. al- o. c. singly. severe. p. ad. t. d. the. po. t. f. f. th. thigh. d. c. m. f. t. d. The. was. no. h. st. ry. of. t. a. m. p. s. treatment. h. t. lo.

Phy. cal. am. n. t. n. al. d. ll. d. el. p. d. ll. no. hed. mal. wh. s. ht. th. h. fl. ted. t. th. hip. The. m. k. d. m. l. g. a. l. the. right. l. c. f. a. d. l. f. m. m. q. est. bl. tt. h. it. th. l. m. ld. b. f. l. t. Ba. um. e. m. al. d. t. c. p. e. u. f. f. t. f. th. um. at. th. l. l. f. th. l. c. c. t. In. t. en. r. yel. graphy. ho. d. mes. l. d. pl. c. m. t. f. th. ht. md. te. Th. h. t. pl. t. ga. t. Apr. t. n. b. p. y. f. th. ma. sh. d. u. cl. n. d. c. m. A. th. r. wa. n. d. ce. f. d. t. nt. m. t. t. a. expl. rat. ry. p. ti. w. d. Th. b. an. t. abo. the. po. t. ri. p. p. f. th. r. ht. l. m. a. d. e. r. yed. n. l. a. l. m. t. ll. p. rall. l. to. th. c. t. f. th. l. m. d. n. P. p. t. s. ligam. t. nd. th. p. nt. m. p. i. a. t. r. i. ly. bo. th. ma. b. m. it. e. s. f. th. abd. m. n. l. t. t. e. o. d. A. l. g. rubb. ry. m. s. crup. g. th. pp. p. rt. f. th. g. f. th. l. m. d. t. nd. go. pal. th. p. a. l. m. t. e. n. with. th. att. chm. t. t. th. tra. r. p. e. s. e. s. f. th. lumba. e. t. bra. a. f. t. t. p. nt. n. ll. N. d. all. th. m. t. d. d. l. t. th. lo. e. lumbar. er. te. b. c. al. la. g. e. s. ls.



Fig. 3. P. t. per. t. ray. film.



Fig. 4. C 6 L ft P e p t y film sh g t m d f f tur
 Ig 5 \ y film f pec m

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The location of this tumor the gross appearance apparent origin from muscle and the microscopic findings all substantiated the diagnosis of rhabdomyosarcoma. If the patient had recovered from the operation pulmonary metastases or local recurrences would probably have developed within a year.

CASE 6 J G EFSCH No 7018 A 55 year ld
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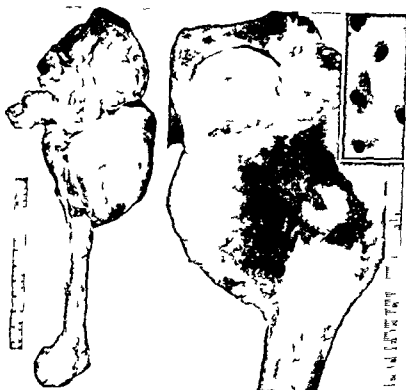


Fig 6 left G os ph t g ph f pec m
 Fig 7 h g t G ph t g ph f pe m cut se tu d m t t u g
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 fig (F 7b) Th t m l g th
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 p ul of b n r p es t

This tumor grew slowly for at least 3 years and examination showed apparently complete removal. Because it was a hemorrhagic cornua probably arising centrally, the epithelium should be a good prognosis, although the possibility of vein invasion (although not confirmed histologically) always possible. This again shows the importance of the pathological pattern in determining the ultimate prognosis.

RECAPITULATION

As a life saving measure transection through or above the innominate bone appears to be a very effective procedure in handling sarcomas of the pelvic parietes and upper thigh. The mortality rate of 14 per cent for the past 10 years as compared with 56 per cent for the preceding 40 year is very encouraging. That only 99 operations of this sort have been reported during a 50 year period is clear indication however that only a very few of these case are being given the benefit of radical surgical removal. A glance at the tables in the book by Geschickter and Copeland confirms this since none of their patients was treated in this manner.

A comparison of our own experience with that of others would indicate that a disproportionately large number of younger patients have been selected for operation. Of the 93 cases reported exclusive of our own only 11 were over the age of 50 and only 2 were over 60. Since Fitzwilliams case represents the only one (besides the authors) over 60 years surviving operation there might have been some justification for such selection in the past. It should be recalled however that a high percentage of osteolytic sarcomas of bone in which the prognosis is extremely poor will be found among the younger group. With the decrease in operative mortality it would seem reasonable to select patients in the future less on the basis of age and more on the basis of the pathology of the tumor.

It is apparent that the benign tumors such as the neurofibromas, benign giant cell tumors, giant osteochondromas and chondromas may be expected to present the best prognosis. The next most favorable group will be the chondrosarcomas arising either peripherally or centrally. The peripheral group arising usually from cartilaginous exostoses will offer the better outlook. Well differentiated soft tissue sarcomas of long duration should be operated upon although the prognosis will be less favorable. Osteogenic sarcomas forming large amount of adult cartilage (Case 1) should certainly have the benefit of operation. This is also true of osteolytic osteogenic sarcomas and very undifferentiated soft tissue sarcomas although among these

the salvage will be very low. Ewing's sarcomas, plasma cell myelomas and metastatic tumors if recognized as such should probably not be subjected to such an operation except under unusual circumstances.

Examination of the surviving patients reveals that in certain instances even more radical treatment is necessary if the results are to be improved. There is no known surgical means of coping with subclinical metastases and many patients presenting these tumors will undoubtedly die of distant spread subsequent to resection as is already known to be true of histologically similar tumors situated peripherally in sites amenable to the commoner types of amputation. On the other hand it is frequently within the surgeon's means to prevent local recurrence as it is a well known tendency for many of these sarcomas unless widely removed to recur stubbornly. Obviously one of the distinct advantages of operations of this sort for tumors in the upper thigh and lower pelvis is the wide removal permitted. Yet of 45 patients followed 8 developed stump recurrences. The first case a chondrosarcoma of the lower innominate bone with incomplete section above had a recurrence 17 months after operation. The second case had a chondrosarcoma of the ileum with section through the notch and there was a recurrence in $5\frac{1}{2}$ years. In the third case a chondrosarcoma of the ileum the gluteus maximus was preserved recurrence 1 month later. In the fourth case a chondrosarcoma of the ileum there was a recurrence in 2 years. In the fifth case an osteochondrosarcoma of the acetabular region section was through the notch recurrence 12 months later. In the sixth case a myxochondrosarcoma of the upper femur an effort was made to save the adductor muscles recurrence 6 months later. In the seventh case a benign recurrent chondroma of the ileum there was recurrence 4 years after operation. In the eighth case a spindle cell sarcoma of the upper thigh section was through the sciatic notch recurrence 5 months later. Probably not all of these were avoidable but it is significant that in 4 of these the innominate bone was completely removed although it represented the site of involvement in 3. In 1 instance the

gluteus maximus muscle was preserved when the tumor was situated in the adjacent and attached ilium. In still another case with tumor in the upper femur attention was focused on the preservation of a long medial skin flap with the underlying abductor thigh muscle and the obturator artery. Six of the 8 recurring cases were chondromatous tumors of bone and 2 were soft part spindle cell tumors. In our first case in recognition of the tendency which bone sarcomas have for crossing joints the entire innominate bone was removed together with a generous segment of the opposite pelvis as well as the ala of the sacrum. In Case 4 the gluteus maximus muscle was removed in order to maintain an additional zone of safety between the disease and the line of section. Both of these patients remain well. Experience to date therefore indicates that fuller advantage of the procedure should be taken in making it as radical as the tumor demand and the anatomy permits. It is firmly believed that when this is done the end results will be considerably improved.

SUMMARY

1 Fifty years have elapsed since Girard first successfully resected a portion of the pelvis along with the lower extremity for a sarcoma of the upper femur which would not lend itself to disarticulation at the hip joint.

2 Similar procedures have now been reported for malignant tumors of the upper femur innominate bone and adjacent soft parts in 99 patients.

3 Although an overall mortality of 8 per cent exists that of the first 40 year period was 56 per cent but during the past 10 years it has dropped to 4 per cent. This drop has been largely due to development in the treatment of shock which has been the primary complication of this operation.

4 Follow up data although woefully inadequate indicates that of 45 patients surviving operation and followed for one to or more years remained clinically well and 4 died of the disease.

5 The deformity although considerable is borne gratefully by these patients who have usually become convinced that the cure remains no hope of cure.

6 The anatomy operative procedure and variations in technique are discussed.

7 Six unselected cases are given all with at least a removal of entire innominate bone.

8 In criticism of the past treatment it may be said that far too few patients have received the benefit of radical operation that the advantages of wide resection have not been sufficiently exploited particularly as regards partial or incomplete removal of the innominate bone when that bone itself represents the site of the tumor that with more adequate control of the mortality patients be selected less on the basis of age and more on the basis of the pathology of the tumor. It is believed that consideration of these factors in the future will favorably influence the prognosis in sarcomas of the upper thigh and pelvic parietes.

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PARACHUTE FRACTURES

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A SURVEY of fractures which occurred in a regiment of paratroop infantry during a 6 month period of intensive training is presented. The injuries sustained in jump training at Fort Benning have been covered by Tobin (2), Lord (1) and Tobin (3). The altitude of the area over which jumps reported in the present study were made is approximately 4,000 feet in marked contrast to the training area at Fort Benning, Georgia, 300 feet above sea level.

The over all incidence of casualties was as high as 10 per cent in some of the jumps at the beginning of training. A casualty was defined as absence of soldier from duty for 24 hours or longer. The number of accidents was rapidly reduced until at the end of the period of training the casualty rate was less than 1 per cent.

The optimum speed of the airplane during release of parachutists is about 100 miles per hour for a static line jump. The pilots had difficulty slowing to that speed in the C-47 Transport at the beginning of training owing to the relatively low density of the atmosphere over the training area. (Mean barometric pressure about 60 millimeters of mercury against 760 millimeters at sea level). The jumps were made at 800 feet above ground level in the beginning of training gradually dropping to 600 feet as the program went on.

The impact at which the parachutist hits the ground is equal to that of a fall from a height of 10 to 15 feet. If the ground is at an altitude of 4,000 feet the impact is equal to that of a fall from 15 to 20 feet.

A wind of over 12 to 15 miles per hour greatly increases the number of casualties. In the area where these jumps are made the standard saying is: If you do not like the wind or weather wait 30 minutes and it will change. Consequently jumps were occasionally made in wind velocities as high as 35 to 40 miles per hour. In practice maneuvers with other airborne troops the jump had to be made as scheduled thus causing some jumps to be made during inclement weather.

Psychoneuroses including hysterical states and malingering were very uncommon in paratroopers. Practically no cases were seen in officers. A few occurred in enlisted men toward the end of training when the outfit was very hot. Most of these were traumatic neuroses involving back pain following a jump and were completely refractory to treatment of any kind physical or psychiatric.

Back injuries were not common. There were 7 cases of compression fractures of the vertebrae. None was complicated by paralysis. There was not a single case of protruded intervertebral disc found during this period of training. Back sprains of any severity were uncommon as the men were taught to land on their feet and roll forward. The 7 cases of compression fracture were all associated with one of two complications: the primary chute did not open and the secondary chute was used or another parachutist accidentally emptied part of the air from the chute which carried the man who was injured. There were no compound fractures and no fatal accidents.

The head injuries included two (2) linear fractures and four (4) of the basilar type. The injuries all happened in a high wind which caused the parachutist to land sideways striking the head in some manner. All recovered but 2 of them were permanently removed from jump status because of post-traumatic symptoms. Encephalograms revealed no evidence of gross damage to the brain. I am unable to state if they were instances of traumatic neurosis or permanent cerebral damage. None of the patients was subjected to surgery.

Acromioclavicular separations were not common. Injuries to the acromioclavicular joint were treated by depression of the clavicle and immobilization. Separation of the coracoid and trapezoid ligaments was repaired by open operation. The technique of Bunnell using fascia lata was employed. There were 4 of these cases. Satisfactory result was obtained and all returned to jumping after 4 months.



Fig 1 ft F t f the l t l p f th g h t t
I g S m f t l g b t 3 d y l t
h g h l g f p o t l p f t



Fig 3 l ft F t f p t l p f t b t h t
d p l t p l t h t 3 d y l t

Following is a list of the types and numbers of fractures skull 6 nose 4 maxilla 2 humerus 5 radius 4 navicular (carpal) 3 metacarpals 6 phalanx 7 rib 4 compression of vertebrae 7 sacrum 1 coccyx 1 femur 1 patella 2 tibia 22 trimalleolar 6 fibula distal portion 29 astragalus 1 os calcis 3 cuboid 2 tarsal 2 metatarsal 7 toes 4 a total of lower extremities of 79 and a grand total of 129

Fracture of the posterior lip of the tibia is so typical a parachute injury that it has been named paratrooper fracture by Tobin (3). This fracture is uncommon other than in parachute injuries and for that reason has received a small amount of attention in the literature of traumatic surgery.

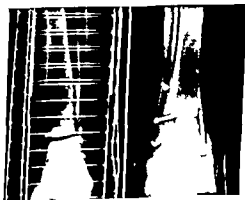
Parachutists are taught to land on the ball of the foot. This is possible if there is no wind

and the terrain is even but too often this is not the situation. These fractures occur when the weight of the body is transmitted through one foot instead of being divided. The excellent type of boot worn by the parachutist prevents the fracture from being more frequent because it distributes the transmitted force through the lower leg.

The anatomy of the ankle joint further explains the fracture. The posterior lip of the tibia is lower than the anterior so that the joint mortise is wider anteriorly than posteriorly. The external and internal malleoli keep the astragalus in line and a transmitted force must shear off the posterior lip preferentially. The posterior one fourth of the joint



Fig 2 Ex cess l l f p t t t ed l h
d t m m bulged P t t h d p f l l k l
j t



F 6 l ft S t m lleol f t f k l h
f t b n b l l g a m t
F A t f h g t l m l l
h x d t h sc d n b l a h x d h t h sc
j p a m l

surface is most commonly involved. Separation of fragments is rare. Open operation has never been necessary in my experience in fracture of posterior lip from parachute injury.

This history is typical of the parachutist landing on one foot in uneven terrain or due to oscillations from a high wind with immediate pain in the ankle joint and great difficulty in walking. In all such fractures which occurred at this Station not one was missed in the field. By this I mean they were sent into the hospital immediately and demonstrated by lateral x-ray films. This justifies the term "paratrooper fracture" because it is so often diagnosed accurately by field medical units.

A method of treatment was established which I would like to describe in detail: (1) A padded plaster cast is applied from the base of the toes to the tibial tuberosity. (2) The foot is placed in the neutral position. (No inversion or eversion) i.e. a line through patella would go between great toe and second toe. (3) The ankle is placed in exactly 90 degrees dorsiflexion. (4) An anesthetic may be necessary to get the ankle in proper position. (5) The patient is kept on absolute bed rest for 1 week with elevation of the extremity on two pillows. (6) After 1 week, the cast is removed and replaced by another cast with a very small amount of padding. A section of wool felt 2 by 2 inches is placed dorsally over the tarsal bones. (7) After 48 hours the patient is allowed to walk on the leg. No crutches or walking calipers are employed. The cast will frequently break on the bottom but good support is given to the ankle nevertheless. (8) The cast is removed after 2 weeks and daily whirlpool baths of 30 minutes in the morning and infra red treatment for 1 hour in the afternoon are given. One week of this treatment will suffice ordinarily and the parachutist is ready for full duty including marches. There will be no circulatory changes in soft tissue or bone, no swelling of the ankle at night and no restriction of motion.

CASE 1 Patient was injured in parachute jump when he landed on his right heel. The weight of the parachute pack on his right heel caused a fracture of the distal end of the tibia. The patient was treated with a plaster cast and was able to walk on the leg after 2 weeks. The patient was discharged after 4 weeks.

neural position on and ankle at 90°. The foot was kept 30 days in cast and patient was discharged after 37 days in hospital.

CASE 2 Patient injured in a parachute jump when his right ankle got caught in the suspension line during landing. The body was twisted and his ankle remained stationary. There was immediate pain, swelling and inability to walk on the right foot. Physical examination showed redness and swelling of the right ankle. Circular plaster cast was applied with a walking iron (Fig. 3, 4). Leg in cast 30 days, patient in hospital 40 days.

CASE 3 Patient injured 1 month before admission elsewhere when he became entangled with another parachute and landed on his left ankle. He treated it as an out-patient but his ankle remained swollen and painful (Fig. 5). A plaster cast was applied for 30 days. Total time in the hospital was 4 days, post-operative result.

CASE 4 Patient injured in a parachute jump at a high altitude and landed directly on his left foot and the distal end of the tibia. There was immediate pain, swelling and inability to walk on the left ankle. Physical examination showed marked swelling of the left ankle (Figs. 6, 7). Operation with a creasol solution of the ankle joint and the fibula was performed. All tibiofibular ligaments were torn. Leg in cast 4 days, patient in hospital 51 days, convalescent 27 days, total of 82 days, a very good result.

Case 1 shows the ideal result when the aforementioned routine is carried out.

Case 2 demonstrates an increased length of time when the ankle is not immobilized at exactly 90 degrees.

Case 3 shows the permanent disability that may occur in an ankle if the fracture is not recognized primarily and properly treated.

Case 4 shows a severe type of fracture and the good result obtained from open operation.

CONCLUSION

1. A review of the number and type of fractures encountered in parachute training of a regiment at a relatively high altitude is presented with a brief discussion of the cause of such injuries.

2. Typical case histories of paratrooper fracture are outlined.

3. A detailed method of treatment of paratrooper fracture is given.

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opening up of the perirectal space by finger dissection the best possible drainage is acquired. To avoid turning the patient the lithotomy position with a sandbag under the sacrum should be used for excision of the coccyx. A wound near the lateral border of the sacrum may be extended vertically along the side of the coccyx and sacrum good access to the perirectal connective tissue plane is thus obtained.

There is never need to destroy the sphincter mechanism by division of the anorectal musculature but dilatation of the anus and the insertion of a large tube at the end of the operation will aid drainage.

During convalescence if the perirectal space has not been drained and there are signs of spread of infection no time should be lost in opening up this area.

With bursting or explosive injuries because of the time lag extensive soiling etc. it is usually unwise to attempt reposition of the retracted bowel. When this has been done sutures have usually cut out and what is more serious drainage has been inadequate sepsis is kept up by pocketing under skin flaps etc. In one such case the patient improved only after pocketing under bridges of skin and extension of sepsis into the buttocks were treated by laying open widely the whole area. The speed with which the perianal wound healed and the patient improved was a tonishing. The anal canal will function normally whatever its position if its nerve and muscle control has been preserved. Wide excision of the perianal musculature is usually unnecessary and should be avoided.

Foreign bodies encroaching on the sacral canal should be treated with caution and caution since there is a definite risk of meningitis. One such patient arrived at the Base with established meningitis which responded to sulfapyridine the metallic foreign body was removed 4 weeks later the patient having sulfapyridine before and after operation. In this series removal of a foreign body on the 8th day was followed 10 days later by death from meningitis.

Intaperitoneal wounds. When an abdominal lesion has been diagnosed exploration of the entry or exit wound should be deferred

until the abdomen has been opened and the pelvis examined. It may be possible to suture an intraperitoneal tear or if this cannot be done the damaged area may be shut off from the general peritoneal cavity by means of the omentum or a Coffey drain. A catheter is placed down to the site of injury, a colostomy established and the abdomen closed. A suspension of 10 grams of sulfadiazine in 50 cubic centimeters of a solution of gelatine and saline (1% gelatine in normal saline) is injected down the catheter. The wound of entry, exit or both are then trimmed and enlarged for drainage turning the patient should be avoided if possible. The wicks of the Coffey drain are removed piecemeal after the 3d day.

Colostomy. The most desirable site for a colostomy is as near the rectal lesion as possible i.e. a sigmoid colostomy with a good spur. If a plastic repair operation is considered likely in the future it is best to leave a good loop of colon below the temporary colostomy. In cases of urgency the colostomy may be performed through the exploratory incision. For an extensive wound of the pelvic rectum on with a short sigmoid loop a transverse colostomy will make future operation on this portion of the gut easier. It must always be remembered however that the prime object of the operation is to save life.

Repair of rectal perforations. This problem will not be faced as a rule for several months after wounding. Continued infection especially from osteomyelitis will prevent plastic operation but it is important during this waiting period always to assure free drainage and complete exclusion of the rectum by means of a satisfactory colostomy.

Unless there has been extensive tearing of the gut intraperitoneal wounds will probably finally close themselves the difficult cases are those extraperitoneal wounds which in the rectum under cover of the sacrum especially with a fistula passing through the bone. The internal opening of these fistulas is usually obscured by a shelf of mucosa and the rectal wall is firmly adherent to the sacrum.

Daily injection into the distal loop of the colostomy of a freshly made 20 per cent suspension of sulfasuxidine in water (pH 7) is useful in controlling infection.

Penicillin will undoubtedly help in the closure of these fistulas. In the case of one patient with a large tear in the posterior wall of the lower third of the rectum early repair was attempted followed by the use of penicillin locally.

64043 2 Cpl BR had pe f ting m tar nd if the back nd buttock. Operat as d ne 14 ho after wound g— try nd ju t to left of th rd l mbar erte b e t wou d l f b tt ck. A larg ectal tear w palp ble digital am na tio f th rect m T let of you d —left g inal c l tomy—n ntra bd minal contamin t on P t perat ve t atm nt c ns st d of admn str t on of ant g sg g es uma d a f l l co of sulf a m de Cont uo ntrav o gluc sal e was a l o dm n t red.

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Ope t n w s done 26 d ys fter w und g The buttock o d wh h l d t bar bon was c s d rably e l r g d nd th t ck f th m s l s l id pe by d v d g the att chme t f th gluteus ma mu f om th coc v and la t t op c of th um the ccy w s e c s d Ther w a h l v r t ches l g a d abo t s nch le th l it d f the post i ect l w l l Th t m t g the vith ts fa cia pr pia vas m b l d uf fic ntly nd aft the eds g f th ect l d fect eef h d th w c l ed by n e t g s t r e f c d by Lembe t suture n th f cia A cath te pl ced i fr nt f the cr m p to th acral f t e t a d th k wa mplet ly sutur d pa t i o m a e t f th cath t th l r p to th b t t ck The w nd r gat d the t m daly ith 500 ts of Fl ey p cll th o gh th cath t

Th t el the ct m bok do pa tally d pu d chag d f m the t m a d l t m y th p t s g l d t x l l t d th k h a d dly—he h d b l d nte al f t ul Tw m th f t p t d an ge fo t omy l t f th c m nd que t ct my we e c s ary F f t d y l t th e a a t i y s p r f i c l w o n d o the m wh h h l g r p dly Pen cll n h d m de pos bl e n n the p e c f te my el t i f th cum th ners fa l g e t r al ectal f i t l a int a sm l l ne f th b l nd ntern l t ype

ANALYSIS OF CASES

In a series of 32 penetrating wounds of the rectum there were 26 extraperitoneal lesions and 6 intraperitoneal or combined. Since most of these patients were seen at the Base it seems that either intraperitoneal injury is less common or more likely extraperitoneal damage to the rectum is less dangerous. Rapidly fatal acute infection occurred in both types of wound.

Extraperitoneal Wounds

Of the group of 26 extraperitoneal wounds there were 5 of the *anorectal region* complicating wounds of the buttock or perineum. In 3 the anorectal area was torn while in the injury was mainly of the bursting type of injury of the perineum with retraction of the anal canal. The 3 patients with avulsion of the anorectal region were treated by colostomy and drainage. In 2 the colostomy had been postponed for 3 days. 1 of these died of gross infection of the wound. The 2 bursting injuries were also treated by colostomy and by reposition and suture of the retracted anus. In both cases the sutures gave way though in 1 case the right side of the anus remained in position. During convalescence the provision of free drainage necessitated wide division of the skin and the laying open of all subsidiary pockets in 1 case. In 3 of the 5 cases fracture of the bony pelvis (ischium pubis and coccyx) complicated the anorectal wounds and in 1 case the extrapelvic urethra was injured.

There were 21 wounds of the rectum and the site of entry was as follows: buttock 11, sacrum 7, groin 1, hips 1, buttock and groin 1. The diagnosis of injury of the rectum was not made in 7 cases (one third) until feces or flatus were passed through the entry wound 4 to 6 days after the wounds were received. In 1 case with associated bladder injury the poor condition of the patient suggested injury to the rectum on the second day. Five of the 7 undiagnosed cases were treated by late colostomy. Two died 1 with associated bladder injury, the other from meningitis following removal of a foreign body from the sacral canal on the 8th day.

Injury to the rectum was diagnosed in the remaining 14 cases (two thirds) as follows:

blood per rectum on examining finger 2 extensive sacral wounds with fracture 2 feces in the entry wound 2 tear palpable 2 blood per rectum and palpable tear 1 tear visible 1 exploratory laparotomy—marked extra peritoneal hemorrhage spreading into meso sigmoid 1 no record 3

The time lag in the cases of wounds of the rectum was recorded in only 11 of the diagnosed cases within 12 hours there were 5 cases and of these 1 died of hemorrhage and shock and 5 of fulminating infection within 12 to 24 hours there were 5 cases and all recovered but 1 was traced for only 7 days and 1 other died from infection 7 weeks later within 29 hours there was 1 case and he recovered. Two of the 5 cases in which operation was done within 12 hours had severe injuries and were not expected to recover. The number of cases (including the undiagnosed) that recovered in spite of a long time lag is surprising. Even though these injuries may kill quickly from fulminating infection a number of patients recovered even without early colostomy.

Of these 1 cases with wounds of the rectum 14 were associated with fractures (two third) as follows fracture of the sacrum 6 fracture of the ischium 4 fracture of the pubis 2 fracture of the coccyx 1 fracture of the ilium 1. In 2 of these cases the femur was fractured in addition and in 1 the fracture extended into the hip joint.

Other organs were affected as follows bladder 2 of which 1 died urethra 1 who died cauda equina 1 who recovered.

In the cases which were diagnosed treatment consisted of colostomy with or without abdominal exploration the wounds were trimmed and enlarged for drainage. Though in these cases there is no definite information available of the use of local or general chemotherapy its use was routine. Anticancerous serum was also used in a few cases.

Intraperitoneal and Combined Wounds

There were 6 cases in this group. The site of entry wound was as follows buttock 3 sacrum 2 perineum. As to diagnosis all had signs of intra abdominal injury but in 2 cases only was there any indication of a

rectal lesion before laparotomy—1 with blood on the examining finger and the other had a large sacral wound.

The time lag was 8 to 16 hours except in 1 case in which the lag was 24 hours and in another 36 hours. One patient with a time lag of 8 hours and another of 36 hours died of acute infection. The 16 hour case in which patient recovered passed a large *Ascaris lumbricoides* on the 16th day. In the 24 hour case patient had an extraperitoneal lesion of the rectum and though the rectovesical pouch was full of blood no intraperitoneal lesion was found. This patient had several secondary hemorrhages from the wound rectum and colostomy requiring ligation of the superior gluteal and finally the internal iliac artery.

Other injuries found in this group were fracture of the sacrum in 2 cases and injury of the small gut in 4 cases.

All patients in this group were treated by exploratory laparotomy colostomy and drainage. In 3 cases the intraperitoneal rectal tear was sutured and all recovered in 2 cases suture of the intraperitoneal tear was impossible and both died in 1 case the rectal lesion was extraperitoneal and patient recovered. Local sulfadiazine were used except in the 36 hour case with general peritonitis and for the extraperitoneal injury of the rectum.

Nonpenetrating Wounds of the Rectum

There were 6 cases in this group. In 3 cases abdominal tenderness and rigidity suggested intraperitoneal damage and exploratory laparotomy was performed. In all the 6 cases there was extensive retroperitoneal hemorrhage in the pelvis with peritonitis though in 2 there was no evidence of penetration of the peritoneal cavity the small gut was injured in the third case. The time lag in the case exhibited abdominal signs without penetration of the pelvic cavity was 1 and 6 days. Colostomy was established in all cases. In the fourth case exploratory laparotomy was performed because an extensive sacral fracture indicated an injury to the rectum a colostomy was made as there was present a large retroperitoneal hematoma. In the remaining 2 cases colostomy was not performed. The

foreign body was removed from the pararectal tissues in 1 in the other a small foreign body could be felt through the rectal wall. This patient complained of pain in the perineum especially on defecation pressure on the foreign body produced pain in the distribution of the 3d 4th and 5th left sacral nerves. A small granulomatous nodule in the region of the foreign body was visible on sigmoidoscopy.

Complications

During convalescence it is important to maintain adequate drainage constantly. Osteomyelitis not infrequently follows injury to the bony pelvis and pocketing and tracking of pus occur. Large wounds of the sacrum are difficult to nurse and are subject to prolonged infection with its concomitant risks. Meningitis following lodgment of foreign bodies in sacral canal has already been mentioned after considerable time preliminary sulfonamide therapy and gentleness in removing such foreign bodies are essential. Only when a foreign body here requires removal should it be operated upon. Diphtheritic infection of the sacral wound was seen in 1 case. Secondary hemorrhage complicated 3 cases—rather a higher incidence than with wounds of the extremities.

Deaths

In the extraperitoneal rectal wounds there were 8 deaths. Two occurred within 4 hours, 1 from a fulminating infection and 1 from hemorrhage and shock. The death from fulminating infection (colon septicemia) occurred in a soldier who was operated upon 12 hours after wounding. His wounds were severe including a fractured femur and a torn urethra and injury to the small gut in the rectovesical pouch. He died of profound toxemia with a terminal temperature of 108 degrees. One died within 48 hours from a fulminating infection (colon septicemia). He was operated upon 1 hour after wounding. The abdomen was distended but there was no peritonitis. One died within 5 days. Operation was performed 8 hours after wounding. There was extensive retroperitoneal bruising. He became jaundiced after blood transfusion but death was most likely due to severe infection. Two died within 14 to 21 days, 1 on the 16th day

from gas infection of the abdominal wall and thighs and secondary hemorrhage one on the 18th day from meningitis following the removal of a foreign body (time lag 8 days). Two died after 1 month in 1 death occurred in 48 days from infection following injury to both bladder and rectum with a rectovesical fistula. The rectal injury was not diagnosed and colostomy was performed late. In the other case death occurred in 49 days from an anaerobic streptococcal infection associated with fracture of the sacrum and neck of the femur. Chemotherapy and repeated blood transfusion were of no avail.

There was 1 death in the anorectal wound group. Death occurred in 10 days from extensive infection of the perineum and buttocks together with bronchopneumonia. Colostomy had not been performed until the 3d day.

There were 2 deaths among the intraperitoneal wounds. Both occurred within 6 days. In 1 from an unsutured tear of the rectum treated after a 36 hour time lag by drainage and colostomy. Patient was jaundiced before death and had peritonitis and toxemia. In the other from an unsutured tear of the rectum treated after an 8 hour time lag by drainage and colostomy. Patient had acute toxemia but no evidence of peritonitis.

In the nonpenetrating wounds 1 patient died from a wound which involved the thigh and the pelvis was fractured, anaerobic streptococcal infection and osteomyelitis developed and death followed in 1/2 months.

In the last world war a small series of wounds of the rectum complicated by wounds of the small intestine showed a mortality rate of 100 per cent while in the Middle East in this war a small series of similar wounds showed a mortality of 71.4 per cent (Ogilvie). In this paper since there is no information available of all the deaths from wounds of the rectum in the Forward Units a mortality figure cannot be given. However compared with the last war the number of survivors suggests an improvement in results.

SUMMARY

1. The classification and diagnosis of wounds of the rectum are discussed.
2. Operative treatment of extraperitoneal, intraperitoneal and combined wound is de-

scribed. The indications for drainage of the pelvic cellular tissues are given.

3. The risk of spread of infection within the pelvis with nonpenetrating wounds is mentioned.

4. Thirty-two penetrating and 6 nonpenetrating wounds of the rectum are analyzed.

a. Among the penetrating injuries there were 26 extraperitoneal and 6 intraperitoneal or combined wounds.

b. Early diagnosis was made in only two thirds of the extraperitoneal wounds; the methods of diagnosis are shown. Signs of

intra-abdominal injury were present in all cases of intraperitoneal or combined wound.

c. The incidence of various sites of entry wounds, of fractures of the pelvis and of other injuries is given.

d. The time lag, complications and deaths are considered.

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CONCUSSION OF THE SPINAL CORD

An Experimental Study and a Critique of the Use of the Term

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Ch cag Illin s

THE meaning of the term concussion of the spinal cord is sufficiently vague to be a source of irritation to those who wish to use it. The present investigation was undertaken because it was felt that experimental clarification of functional and morphological aspects of an uncomplicated injury to the spinal cord of the type which rightfully deserves to be called concussion was needed to aid in restricting the sphere of application of the term. Studies in brain concussion (13, 14, 4) provide a lack of ground for the present experiments.

As will be described in the present report, an uncomplicated concussion of the spinal cord in the cat is a complete functional block of the spinal cord at the level of application of an adequate force to the nervous plexus. Nerve cells especially of interneurons and long ascending and descending fiber tracts are involved. The period of concussion is brief, passing into the period of postconcussion when the paralysis ceases. Subtle but histologically demonstrable cell alterations occur in concussion and frank chromatolysis is evident in postconcussion as a direct result of the injury sustained. In any species if some other morphological change is present, e.g., compression fracture, self-reducing fracture, dislocation, severe epidural or subdural bleeding, contusion, or laceration of the spinal cord or spinal nerve roots or in intramedullary hemorrhage, which superimposes functional alterations upon those of concussion on the injury is not concussion but concussion plus the complicating injury.

MATERIAL AND METHODS

Concussion was produced in cats by striking a single blow against the back of a freely suspended animal with a blunt wood instrument, using in a horizontal plane. Chalk applied to the instrument enabled accurate determination of the site of the blow. Most of the animals were lightly anesthetized

with chloralose. Others were struck after the spinal cord had been transected at the mid-thoracic level under ether and the region of the operation anesthetized with procaine. The blow was strong enough to produce a brief paraplegia when applied over the lumbar enlargement in intact unanesthetized cats.

In all animals the saphenous branch of the femoral nerve was exposed on the thigh and a unipolar or a bipolar stimulating electrode was attached to it. In 3 cats a fine bipolar stimulating electrode was placed in one pyramidal tract in the pons with the Horsley-Clarke instrument. The stimulator employed was one which gave a reverse sawtooth wave and the voltage frequency and the falling phase of the stimulus were controllable. Output dial were calibrated to show peak voltage.

The threshold voltages for elicitation of the appropriate responses were recorded over a 10 minute period immediately preceding a blow. Uncomplicated concussion was deemed to have occurred when the threshold rose instantaneously following a blow and then returned uneventfully to the control level. Blows were applied over various regions of the spinal cord. In two of the cats receiving mid-thoracic blows the vagus nerves were cut at the start of the experiment. Observations of functional alterations were made in 27 cats. Seven were allowed to live for 6 days, 3 for 14 days and 1 indefinitely after the concussion; the rest were killed at the end of the threshold testing period. All except the 14 day animals which were used for Marchi degeneration studies were perfused with 10 per cent formalin² (following initial washing out of blood with 0.9 per cent NaCl) while under nembutal anesthesia and were then autopsied.

Ten of the formalin-perfused animals furnished histological material. For additional histological material 3 cats were arranged for perfusion before being struck. The start of flow of formalin as timed so that fixing fluid entered the animal's body approximately 5 seconds after the blow was

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¹Described by D. Craig Goodwin and M. L. Cullough (9).
²Some were perfused with formalin (4) and some with formalin (4).
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struck. Three cats anesthetized surgically prepared and electrically stimulated but not struck served to control the histological phase of the work. Preparation of the spinal cord material and staining of the Nissl bodies myelin sheaths and axis cylinders were carried out as described in a previous paper on brain concussion (42). Some cords were sectioned transversely others longitudinally in the coronal plane. Serial sections were obtained from spaced regions of the entire cord.

The method for staining the Nissl material of the nerve cell cytoplasm was designed to give great uniformity of results. It employs dilute solutions of thionin made up in buffers of pH 4 to pH 4.5. Staining is carried progressively to completion and decolorizing is unnecessary. Control and experimental material of the present study was stained together simultaneously.

In order to facilitate the interpretation of cell changes which occurred in the spinal cords of the experimental animals ventral roots were sectioned intradurally in 5 other cats and the animals were sacrificed 6, 12 and 8 days after operation. Two or three roots were cut in each animal and the series embraced the third lumbar to the first sacral inclusive on one side only. Control material was afforded by the intact sides of the cord and by portions of the adjacent segments cranial and caudal to those corresponding to the sectioned roots. The animals were fixed by perfusion with formalin-acetic acid sodium chloride solution (4). The appropriate portions of the spinal cords were serially sectioned longitudinally in the coronal plane and the sections were stained by the method for Nissl bodies (42).

PHYSIOLOGICAL RESULTS

Stimulation of the saphenous branch of the femoral nerve elicited reflex contraction of muscles supplied by the sciatic nerve. A distinct foot movement was chosen as the response for observation. A blow applied ventroproximo to the sixth lumbar spinal cord segment produced concussion the severity of which was determined by the magnitude of the reaction and the duration of the erythema of the threshold threshold threshold reflex. The severity of the concussion measured with the strength of the blow. The leg extended the extent of spinal cord involvement was upon the leg blow. The blow produced the strength of that blow. A blow produced concussion at the seventh and eighth thoracic segments did not respond sufficiently to produce concussion at the eighth and ninth segments in the femoral sciatic reflex. The fifth lumbar to the second sacral. It re-

sulted in hyperirritability of the hind quarters to saphenous nerve stimulation. Blows spaced from the eleventh thoracic down to the third lumbar segments caused progressively greater increase in threshold for the femoral sciatic reflex. Effectiveness of blow over the first and second cervical vertebrae in producing concussion of the region of the lumbar enlargement was much reduced.

In the few times observed a femoral-obturator reflex behaved just as the femoral sciatic reflex.

Contraction of the plantaris muscle below the malleolus also resulted from stimulation of the saphenous nerve. A blow produced concussion at the lumbar enlargement caused a rise in threshold of this femoral sciatic reflex. A blow produced concussion at the seventh and eighth thoracic segments did the same.

Stimulation was applied in the pyramid to the hind limb movement and slight forelimb movement. A blow at the lumbar enlargement caused a rise of threshold for hind limb movement. A blow at the eighth thoracic segment likewise resulted in a rise of threshold for forelimb movement. No rise of threshold for forelimb movement in nerves for which originate from cord segments close to the site of the blow was little affected.

Occasionally an animal exhibited considerable general muscular activity on saphenous stimulation. A blow to the lumbar enlargement completely abolished this response while the level of the eighth thoracic segment extended it only rostral to the level of the blow.

In one of the instances in which concussion was produced at the level of the lumbar enlargement the hind limbs immediately extended in tonic spasm lasting 5 to 5 seconds. The occurrence of spasm seemed to be unrelated to the severity of concussion.

Results from an animal with various nerves of peripheral order did not differ from those described above.

In stimulating the saphenous nerve a wide frequency of responses was obtained early always a fall in phase of the response was noted. Critical threshold values (all series combined) for the femoral sciatic and femoral facial reflexes ranged from 0.04 to 0.4. Critical thresholds tended to greater than normal. Stronger stimuli were not used. In two-thirds of the instances threshold returned to the control values. In the rest thresholds returned early to control level. Recovery was generally accomplished in 1 to 5 minutes although the time ranged from less than 1 to 5 minutes. In general threshold fell gradually though the recovery period usually faster during the early period.

For stimulation in the pyramid a frequency of 100 per second was employed. Control threshold ranged from 0 to 50 volts. Other details were the same as those described in connection with saphenous stimulation.

No gross functional aberrations referable to spinal cord damage were seen in the injured cats in a period of 14 days after the concussion. There is the possibility, however, that the proper type of test would reveal some abnormalities.

MORPHOLOGICAL RESULTS

Most of the animals which were struck one blow suffered no hemorrhage inside the vertebral canal although many had traces of blood in the musculature at the site of the blow. Some had light extradural or subdural hemorrhage but no intramedullary bleeding. In these and in two cats which suffered complete transverse fractures of intervertebral discs without any alteration inside the vertebral canal there were no functional indications of the complicating condition. A second or third hard blow at the same level often produced intramedullary hemorrhages or extensive subdural bleeding leading to compression of the cord. Delayed effects of the complicating injuries upon thresholds could usually be observed in such cases. In 21 instances very strong blows produced fractures which lacerated the cord and produced functional results readily distinguishable from those of concussion.

Histological examination of the affected region of the spinal cord of the animals perfused immediately after the blow revealed subtle changes among all nerve cells except the motoneurons. The Nissl bodies of most neurons seemed to be agglutinated and the nucleolus was more often irregular as compared to control material and as compared to more remote segments in the same animal. These changes were essentially the same as reported in the brains of guinea pigs upon concussion (42).

The chief histological alteration found in the spinal cord 6 days after concussion was chromatolysis of nerve cells at a level underlying the external site of the blow. The principal participants in this reaction were interneurons of large and intermediate size of both dorsal and ventral grey columns. Many were reduced to mere shadows which could not be photographed although all stages of degeneration were found. Some may be seen in Figures 4 to 8. The smallest interneurons were probably also affected perhaps even diminished in number but it is difficult properly to assess changes in these small cells.

The longitudinal spread of this process of chromatolysis in the number of cells affected by it

were directly proportional to the severity of the concussion. Following a moderate concussion many chromatolyzed cells were found within about a 3 centimeter length of cord. For a distance of about 1 centimeter beyond either end of this region were found a relatively few scattered cells undergoing chromatolysis.

A comparison of the concussion material with spinal cords from animals in which ventral roots had been sectioned intradurally revealed two pertinent points. First relatively few motoneurons (cells which under ent chromatolysis following severance of ventral roots) underwent chromatolysis after concussion and these were located within a few millimeters of the center of the affected length of spinal cord. Second most of those chromatolyzed motoneurons found 6 days after concussion were in a stage of degeneration far beyond that of motoneurons 6 days (or even 12 or 18 days) after ventral root section. Compare Figure 2 with 3.

The only axillary abnormalities seen in the spinal cord 6 days after concussion were some terminal bulbous enlargements. These occurred only in the more severe concussions and then to what would seem to be an insignificant extent. They were nearly entirely limited to the lateral funiculus in a segment of cord 3 or 4 millimeters long at the middle of the injured region. The absolute extent of this pathology was 0 millimeters to 15 millimeters.

Myelin sheaths as studied with the Weil stain were normal. So were blood vessels. There was no proliferation of glia or transformation into pathological glia in the injured regions. Dorsal root ganglia, dorsal roots and ventral roots showed no abnormalities 6 days after concussion even at the level of most intense chromatolysis within the spinal cord.

One cat was allowed to live indefinitely after sustaining three spinal cord concussions, one of which was severe. The animal remained healthy, continued to grow, and showed no abnormalities. At last observation 7 months after the injuries were inflicted the cat weighed 4.12 kilograms as against the original weight of 2.95 kilograms. Thus spinal cord concussion was not followed by slowly progressive degeneration in the spinal cord due to primary nervous tissue damage or to vascular involvement.

DISCUSSION

It would seem that one important function of spinal cord concussion is interruption of function of the cell bodies of the interneurons and to a much lesser extent of the lower motoneurons. Certainly



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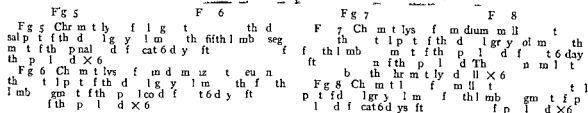
it the interneurons which show the principal histological alterations in spinal cord concussion and postconcussion and it is the interneuron cells which bear the brunt of the functional and histological changes in brain concussion. A blow over the lumbar enlargement abolishes the motor response of the hind limb to a stimulus applied to the pyramidal tract in the posterior. This is most likely due to paralysis of interneurons of which pyramidal tract fibers descend (7) then to paralysis of them to neurons themselves. We recall that in brain concussion the excitability of the cerebral motor nuclei was usually not at all or but little decreased while reflexes involving the cerebellum were not elicitable (3). Since in brain concussion the fibers were not blocked the seat of these reflex disturbances

seem to have been the interneurons.

The present experiments demonstrate that the element of concussion of the spinal cord block of long descending and descending nerve fibers. This differs from brain concussion in which the functional integrity of nerve fibers is little if any affected (3). The discrepancy is probably related to a difference in the mechanical nature of the lesions of the two parts of the central nervous system. Whether or not short nerve fiber and the terminals of long nerve fibers are blocked spinal cord concussion is unknown.

Of these the observation that some degree of tetanic hindlimb clonus is observed in four of the convulsions of the group of the limbic enlargement and that tetanic clonus occurs





in any concussions of the midthoracic region. If the conduction block in nerve fibers which we demonstrated was analogous to that which K. Ems Schoepfle and Erlanger observed in the dissected sciatic nerve of the green frog compressed by a blast from an air pistol we should have expected to have obtained better evidence of the immediate discharge which preceded partial or complete block in the preparation and of the repetitive spikes initiated in the blocked fibers. If the *sequence* of concussion is a depolarization of nerve cell membranes with resulting massive discharge as W. L. Kollros and Case have stated, we should have expected tetanus of hind limbs to have been a constant concomitant of concussion of the spinal cord in the region of the lumbar enlargement. Since tonic spasm when it did occur was not clearly associated with any magnitude of blow or severity of block it cannot reasonably be said to have indicated concussion.

All evidence indicates that the lysis of Nissl bodies in postconcussion is directly attributable to physical injury of the cells sustained at the time of concussion. In both brain concussion and spinal cord concussion morphological evidence of this immediate physical injury may be seen as a subtle intraneuronal disorganization. The postconcussional chromatolysis is clearly different from that following axon section as previously. Finally, the evidence usually no evidence of inflammation following concussion.

Spinal cord concussion at the level of the phrenic nucleus or higher would perhaps lead to fatal arrest of respiration. We have made no study of the effect of high blows because the topography of the cervical region practically precludes the possibility of uncomplicated spinal cord concussion.

There is reason to believe that spinal cord concussion as suffered by man is more severe in its physiological aspects than in the cat. In the cat a midthoracic blow does not alter the threshold for the femoral sciatic reflex but in man it probably could due to the much greater depth of spinal shock to which man is subject. Perhaps intervention of spinal shock can in some way lengthen considerably the period of functional recovery following a reversible spinal cord injury. In addition there is the possibility that spinal cord concussion can be more severe in man than in laboratory animals because of the greater strength of the vertebral column and consequently the greater force that can be applied to the nervous tissue without producing complication.

A major aim of the present study is clarification of the term concussion. Persistent use of it to cover traumatic injuries of the brain and spinal cord displacing the most diverse clinical and pathological findings has greatly muddled thinking and writing on this important subject. This state of affairs is mildly indicated in so recent and excellent a book as *Texts of the Skill Examination and Spinal Cord* edited by Brock, where different

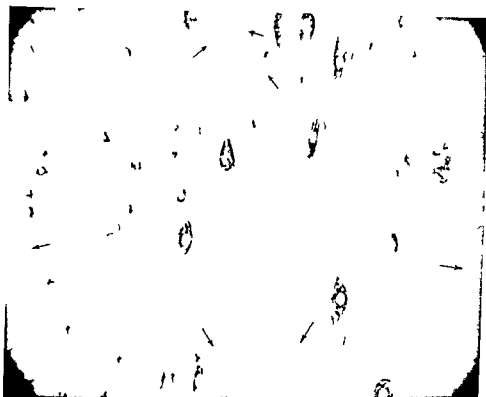


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contusion the signs of the latter injury will become manifest as concussion passes off. Recovery from the symptom of spinal cord concussion in humans according to Knight may occur within 24 hours or be delayed for a week or more.

The indiscriminate use of the terms spinal cord concussion or spinal concussion are in and has been perpetuated by uncritical clinical pathological and experimental observations. Pathological studies in man were all on severely injured patients or else were not judiciously appraised from the etiologic standpoint. All or part of the lesions found were assigned to concussion. In the laboratory very severe injuries were inflicted on animals and were called concussion. No adequately correlated functional and histologic experimental studies were produced. Consequently no one knew what sort of pathological picture a recovered case might have displayed. In addition the attempt was never made to dissociate early functional disturbances from excessive pathological changes in order to cover the maximum functional aberrations which could occur with the minimum anatomical alterations. Hence in the clinic and in the laboratory trauma which affected the spinal cord without grossly contusing or lacerating it was said to result in concussion regardless of the real nature of the lesions. If the spinal cord was directly contused or lacerated by a missile or bone fragment it was still said to have suffered concussion adjacent to or even remote from the directly contused or lacerated area if the other parts showed any pathological changes. In this way concussion came to be used as a very nonspecific term and what was most unfortunate the use of other more specific terms as passively discouraged.

Erichsen wrote in 1886 (1st ed 1885) that there are four forms of lesions leading to fatal results: cases of spinal concussion (1) hemorrhage within the spinal canal (2) laceration of the membranes of the spinal cord and extrusion of the medullary substance into the spinal canal (3) extravasation into the substance of the spinal cord and (4) disintegration and perhaps inflammatory softening of the spinal cord. Erichsen also mentioned molecular disturbance and anemia as causes of concussion. Further he included as spinal cord concussion case in which injury was remote perhaps not even affecting the vertebral region followed by general nervous disease and injuries in which symptoms were delayed and transient or rose.

Obersteiner described as concussion a case of gunshot injury of the spinal cord. The survival time was 5 weeks. There was an extensive area of softening and widespread degeneration of the spinal cord.

Page in 1885 (1st ed 1888) severely criticized the writings of Erichsen and others. He was of the opinion that their reports were based upon faulty interpretations and that there was no evidence for their conclusions. However he contributed nothing constructive to the knowledge of spinal cord injuries.

Spiller reported fatal injuries in a kitten (30) and in a human being (40) which he called concussion of the spinal cord. Pathological alterations were minute hemorrhages and Marchi degeneration. In the kitten there were alterations of the anterior horn cells.

In 1900 Hartmann published a paper on uncomplicated traumatic spinal cord diseases. The title is somewhat misleading because by uncomplicated the author meant all the cases in which there was no persistent injury to the vertebral column such as fracture or unreduced dislocation. Symptoms set in at once or were delayed. The pathology included primary and secondary fiber degeneration, hemorrhages, foci of necrosis, degeneration of anterior horn cells, root degeneration, glia proliferation, blood vessel changes and meningeal involvement. The blood vessel changes were considered to be very significant and to lie at the root of much of the other damage.

Holmes, Claude and Lhermitte (5, 6). Lhermitte (26) and Ferraro (11) reported on spinal cord pathology in a soldier in whom the vertebral column was injured by a projectile without the spinal cord receiving a direct wound. The cases were spoken of as concussion. Clinical symptoms were those of total or subtotal transverse cord lesions. All found foci of necrosis, cavitation, acute primary degeneration of nerve fibers and glia proliferation within several segments of the level of injury. Besides Claude and Lhermitte (5) and Lhermitte (26) found spinal nerve root degeneration and alterations of the central canal. They declared that the bodies of nerve cells of the gray substance were remarkable in their resistance to concussion. In addition Ferraro (11) found focal hemorrhages and changes in the wall of blood vessels. Holmes also found hemorrhages.

Marburg (30) and Marburg and Ranzi (31) described the pathology of the same type of injury cases but refrained from applying the name concussion to any of them. The most important change Marburg believed was an alteration in the walls of blood vessels leading sometimes to occlusion. He felt that most of the other pathology was the result of vascular alterations.

Mott referred to a case as spinal concussion in which there was a paralysis of arms, legs and intercostal muscles together with anesthesia below,

the second cervical level and followed in 2 days Extensive meningeal and intramedullary hemorrhages were found. The cells in the phrenic nucleus at the fourth and fifth cervical segments were entirely destroyed. There was vacuolation of myelin and swelling of axis cylinders at the seat of the injury.

Hassin (16) reported as concussion of the spinal cord a case in which the patient tripped over a wire and fell striking his right shoulder. He arose and resumed work. Weakness of the right hand was present 4 weeks later and by 11 months both arms and legs were weak and showed wasting. The patient died of pneumonia 18 months after the fall and shortly after a laminectomy which had revealed no evidence of fracture or dislocation or dural lesion. There were widespread degenerative changes of the anterior horn cells associated with proliferative neuroglial alterations. There were microcystic foci of degeneration or softening in the anterior horns in the lower cervical region. The posterior horns and Clarke's column showed practically no nuclear cell. Fiber degeneration was found in the lateral columns involving the lateral corticospinal tracts, the lateral limiting ones and Gowers' tracts. The fiber loss was said to be secondary to the cell lesions. The delicate cell suffering most from the jar. Hasin attributed the late onset and progressive course of the clinical symptoms to the time necessary for nerve fiber degeneration to become manifest. In this (16) and a late paper (17) Hassin stated the coincidence of concussion of the spinal cord even far away from the region directly affected.

Davison and Keschner attributed to concussion the fibrinosis which they found at various distances below the primary lesions in cases of compression fractures.

Tocas noted that patient dying of sepsis in 8 days and the other of uremia in 14 days formed the basis for the statement of Bald in that primary and secondary degeneration of nerve fibers is characteristic of softening and destruction of ventral horn cells. He mentioned the formation of the spinal cord.

Scheel identified as concussion a case in which the motor symptoms of limb weakness and atrophy were of gradual onset and progressive. The patient succumbed to respiratory paralysis 6 months. Fiber degeneration appeared in peripheral nerve. In dorsal root ganglia the nerve cells were practically normal and the posterior roots were only lightly affected. But in the anterior roots there was fiber degeneration occurring. Widened spaces were fiber degeneration and chromatolysis of anterior horn cells were found in the spinal

cord. Many of the vessels throughout the spinal cord were congested. Diapedesis of red blood corpuscles was found associated with vessels showing degenerative change in the endothelium.

Clifton Clark MacDougal Hartman and C. Samuel reported as concussion a case in which back trauma was followed by paraplegia loss or impairment of sensation and retention of urine. The symptoms began to regress in a few days. Recovery was nearly complete in approximately 2 to 6 weeks. The delayed recovery times probably indicate that the injuries were compression plus concussion.

As has been implied previously experimental work has not been of a demonstrative or clarifying character in injury to the spinal cord. The work of Schmaus in 1890 reported to be a spinal cord concussion considerably influenced thought in the field. He cited fatal cases of the "bumper" being used as a cat to show that the fiber degeneration which is found in the spinal cord at death some time after injury is primarily and is not due to some gross lesion which interrupts the fibers. Besides this is fiber degeneration the fewer the sections in the spinal cord including hemorrhage, softening and cavitation. He pointed out spinal cord injuries about by strong repeated blows on a board laid on the back. It should be mentioned that this method of producing injury by any repeated blows first used by Koford and Filshie in 1874 in his injury studies and frequently employed by others in spinal cord experiments has no practical basis. In Schmaus' work the traumatization was set on the bladders being delivered over a period of a few or many days. He made no further studies. It is probable that animal has seemed completely recovered from the traumatization was topped. In most cases the latent period of the hindlimbs ended and atrophy appeared after the second week. The animal was sacrificed or died to 44 days after the termination of the experiment. The trauma consisted of the order as studied chiefly. In some cases the few histopathological findings in nerve fiber and cell in general the animal which gave the negative result were those which had only a short time. In the tall ante or hemicell of the spinal cord he had haemorrhage which the author had tried to interpret. He thought the microhemorrhages for a long animal on him indicated a molecular or functional change in the cell. The greater change was primary degeneration of nerve fibers. The spinal cord was subdural hemorrhage, catarrh of the medullary sheath, rhabdomyolysis, softening, and catarrh of the spinal cord. The spinal cord of the bladder and of the pineal gland.

Kirchgaesser (20 21) laid a rubber mat on the back of rabbits and struck repeated blows with a hammer on one or several days. Five animals were killed and one died after 8 to 13 days. These were studied by the Marchi and the Weigert method. Five had suffered complete paralysis with partial or complete recovery. These showed extensive primary degeneration of nerve fibers at the level of the blow and ascending and descending degeneration elsewhere. In a sixth animal which had exhibited brief tetanic spasms only, the changes were not as great. Two animals with different degrees of trauma and paralysis were killed 15 to 17 days after the start of the experiments and the material was used for Nissl and for Marchi preparations. Fiber degeneration was severe but cell changes were considered by Kirchgaesser to be practically negative and capable of playing only an incidental secondary role to the striking fiber changes. These injuries were all called concussion.

Jakob produced spinal cord trauma and although he did not specifically designate it concussion others have done so. The injuries were produced in rabbits by striking hammer blows against a board laid on the back. Two to 12 blows were delivered on 1 or 2 days. In 3 animals which died within half an hour there were no changes in the central nervous system except hemorrhages but the liver was ruptured in 2 of them. In 3 animals killed 21 to 32 days after the first injury there were extensive primary and secondary fiber degeneration on variable degrees of softening and hemorrhages, a few scattered degenerating cells and head ganglion cell degeneration at the edges of the softening and around the widened central canal. In an animal killed at 45 days there was secondary degeneration of fibers and in one killed at 4 months there were degenerating fibers and fresh hemorrhages. The last 5 rabbits were paralyzed in the hind quarters for periods ranging from more than 1 day to 1 days. Two animals were each dealt two light blows which produced short tetanus of the hind limbs without indications of paralysis; they were killed 2 days later. There was widespread diffuse fiber degeneration but no cell changes. In one of these animals there were a few small hemorrhages in the spinal cord.

Marinesco reported on experimental concussion lesions produced by exposing dogs to gun cotton explosions. Lesions were most acute in those animals which lived 8 hours after the injury. In the spinal cord punctate hemorrhages were especially numerous in the anterior and middle gray substance of the thoracic region. Nerve cells enclosed in these hemorrhagic foci were undergoing chromatolysis. The small peripheral

mal vessels were congested and the central canal was irregular in contour. The cells of the spinal ganglia were normal despite hemorrhages about the ganglia and in the neighboring portion of the dorsal roots.

Mauret and Durante produced so called concussion lesions in rabbits by exposing them to the detonation of explosives. Early lesions in the spinal cord consisted of slight pial bleeding, perivascular ecchymoses more abundant in the white than in the gray matter and hemorrhages in the roots. Fiber changes were described but whether they were artifacts or true concussion alterations was left open. There were no changes in nerve cells of the spinal cord or dorsal root ganglia. Some animals were allowed to live for 5 to 9 months. They showed no abnormal behavior. No macroscopic lesions were found. In the spinal cord there appeared to be a size inequality of the anterior horns and a diminution in number of motor cells many of which were small and without processes. In some cases fiber changes were seen near the periphery. There was no secondary degeneration in the white matter.

The work of Roussy, Lhermitte and Cornil is one of the most misleading publications on concussion of the spinal cord. These authors first reported on the results of direct trauma against the vertebral column in 6 guinea pigs and 1 rabbit. The animals were struck two to four times in the thoracic region. The injuries were severe not only involving the vertebral column and spinal cord but also the vertebrae and ribs. The authors had trouble obtaining material for histological sectioning because of the mortality of their animals. The animals used were saved as long as possible but their poor general condition always necessitated their sacrifice. The thoracic region of the spinal cord was studied microscopically. In 2 guinea pigs killed 15 to 20 minutes after the blows there was said to be acute primary degeneration of nerve fibers in the peripheral region—axis cylinders were hypertrophied, varicose irregular and very fragmented and myelin sheaths were distended—and the neuroglial meshes were dilated. Two animals which had brief paraplegia and abnormal reflexes and were killed 7 and 8 days after the first blow showed acute primary degeneration of nerve fibers in the marginal zone dilated neuroglial meshes but no changes in the gray matter. In 1 guinea pig and 1 rabbit killed 13 and 3 days after trauma there were macroscopic regions of softening which microscopically proved to be areas of cerebral edema and necrotic foci affecting practically the whole cross section. Finding were negative in a guinea pig killed 5 months after injury. The

the threshold for a femoral sciatic reflex. The severity of the concussion and the longitudinal extent of spinal cord involved increased with the strength of the blow. A blow producing concussion at the seventh and eighth thoracic segments did not spread sufficiently to produce concussion of the region of the cord involved in the reflex. Blows spaced from the eleventh thoracic down to the third lumbar segments caused progressively greater increase in threshold for the femoral sciatic reflex.

A blow producing concussion at the lumbar enlargement caused a rise in threshold of a femoral facial reflex. A blow producing concussion at the seventh and eighth thoracic segments did the same.

Stimulation was applied in the pyramid to evoke hind limb movement and slight forelimb movement. A blow at the lumbar enlargement caused a rise of threshold for hind limb movement. A blow at the seventh thoracic segment likewise readily caused an increase although forelimb movement motor nerves for which originate from cord segments closer to the site of the blow was little affected.

Occasionally an animal exhibited considerable general muscular activity on saphenous stimulation. A blow at the lumbar enlargement completely abolished this response while one at the level of the seventh thoracic segment extinguished it only rostral to the level of the blow.

In one fourth of the instances in which concussion was produced at the level of the lumbar enlargement the hind limbs immediately extended in tonic spasm lasting 5 to 25 seconds. The occurrence of spasm was unrelated to severity of concussion.

Histological studies were rigorously controlled. Examination of the affected region of the spinal cord of animals perfused immediately after the blow revealed subtle changes among all nerve cells except the motoneurons. The chief histological alteration found in the spinal cord 6 days after concussion was chromatolysis of nerve cells at a level underlying the external site of the blow. The principal participants in this reaction were interneurons of both dorsal and ventral gray columns. A comparison of the concussion material with spinal cords from animals in which ventral roots had been sectioned intradurally revealed 2 pertinent points. First only relatively few motoneurons (cells which underwent chromatolysis following severance of ventral roots) underwent chromatolysis after concussion and those were located within a few millimeters of the center of the affected length of spinal cord. Second most of those

chromatolyzed motoneurons found 6 days after concussion were in a stage of degeneration far beyond that of motoneurons 6 days after ventral root section.

Uncomplicated concussion of the spinal cord in the cat then is a complete functional block of the spinal cord at the level of application of an adequate force to the nervous parenchyma. Nerve cells principally interneurons and long ascending and descending fiber tracts are involved. The period of concussion is brief, passing into the period of postconcussion when the paralysis ceases. The much greater depth of spinal shock to which man is subject perhaps adds to the profoundness of the functional alterations in man. Subtle but histologically demonstrable cell alterations occur in concussion and frank chromatolysis is evident in postconcussion as a direct result of the physical injury of the cells sustained at the time of concussion.

A review of the literature on spinal cord concussion supports the statements that the term concussion must be clarified and that many of the recorded observations on spinal cord concussion are of questionable value. The functional alterations with their attending histological changes which we have described in this and in other papers merit a specific designation. It is to these injuries of the brain and spinal cord that the term concussion should be applied and to these alone.

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IMMEDIATE SKIN GRAFTING FOLLOWING INJURIES

M. K. KING, M.D., F.A.C.S., Norfolk, Virginia

WOUNDS which can be surgically cleansed, debrided and closed within 6 hours after injury usually heal by primary union. This applies to compound fractures as well as injuries to soft tissues. The secret of such healing is surgical cleansing and is dependent on no anti-septic or bacteriostatic drugs. We have adequately demonstrated this principle in treating several thousand injuries over the past 10 years. Before the introduction of the sulfonamides we routinely closed compound fractures and other injuries when they were seen early.

In war wounds such treatment is not recommended. There is neither the time nor facilities available for the meticulous cleansing and debridement necessary in the first few golden hours. On the home front most patients with injuries come to the hospital early and the conditions are such as to make closed method of treatment safe and practical.

To be successful cleansing must be thorough. Every particle of foreign material and devitalized tissue must be removed from the wound. This treatment requires time, patience, adequate anesthesia and plenty of soap and water. A stiff brush may even be necessary to remove dirt ground into the end of a bone or the bone may have to be cut back for a short distance. Unless one is certain that all dirt has been removed it is safer not to do a primary closure.

We have some additional safeguards in the sulfonamides when they are used in addition to and not as a substitute for surgical cleansing. Sulfanilamide crystals is the usual drug of choice. It may be frosted into the wound just before closure. It undoubtedly has decreased the incidence of infections in wounds when properly used but it should be stated most emphatically that sulfanilamide will not prevent infection in a dirty wound.

Primary healing frequently means a saving in time of weeks or even months. It means decreased hospitalization and expense. It means minimum pain and deformity with maximum functional result.

Unfortunately many wounds cannot be closed primarily because of loss of soft parts or because of swelling. By means of skin grafting many such

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wound can be closed and primary healing achieved. A few examples of such injuries will be discussed.

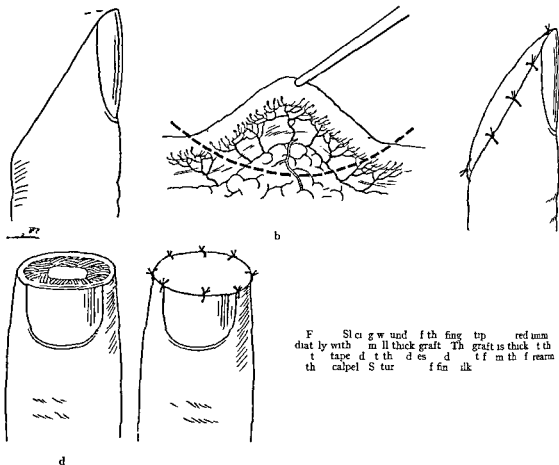
ABRASIVE WOUNDS

This type of injury is usually produced by contact with grinding tools by being dragged over a roadway or by contact with a moving cable or rope. The wound is painful and dirty and the dirt is ground into the underlying tissues.

Treatment consists of thorough surgical cleansing under adequate anesthesia and covering the surface with a partial thickness graft (Fig. 1). Local anesthesia is inadequate. Pentothal is usually very satisfactory. The wound is covered with sterile gauze until the remainder of the limb is thoroughly scrubbed with soap and water and ether. The wound is then irrigated gently and particles of dirt and devitalized tissue are removed with forceps. Sharp dissection should be used when necessary. A small continuous stream of sterile water or saline facilitates the cleansing. Cleansing and debridement should be continued



Fig. 1. Wound of forearm, which has been treated with a partial thickness skin graft. The graft is shown in place, and the surrounding tissue is being irrigated with sterile water or saline. The graft is held in place by sutures.



F. S. C. G. W. U. P. F. H. F. I. N. G. T. P. R. E. D. I. M. M. U. N. I. T. Y. W. I. T. H. M. I. L. L. T. H. I. C. K. G. R. A. F. T. T. H. G. R. A. F. T. I. S. T. H. I. C. K. T. H. T. T. A. P. E. D. T. H. D. E. S. D. T. F. F. M. T. H. F. R. E. A. R. M. T. H. C. A. P. E. L. S. T. U. R. F. F. I. N. I. L. K.

unt 1 one has a surg cally clean v o n d with only h althy viable t ssue rema n n

Finally the surround ng area s pai ted w th meriolate and the v und is draped with sterile sheet A parti l thickness skin graft is taken f om convenient area suffici nt to c ver the wound The cutting may be d ne with a knife o ra or but the P d ett dermatome far super or f r co ering l rge a as Furthermore the grafts are mor unifo m n s i nd th ckness and there is less damage to the donor te A g ft of 004 to 0018 nch i easv t handl g es a good cos metic esult and le es a donor ste v h ch he ls ap dly w tho t scarr g

Bef re the graft s applied the wou d is fr ted lightly w th cryst llne sulf nilamide The gr ft s sutured in posit n und sh ht t ns on by means of fine silk on n at aumat c needle A quilting patt rn f sutures used to b mo th graft int firm app it n w th the unde lyn bed and these sutur s dec ease the need fo ccu

r tely appl ed pre s e postoperati ely (Fig 1 b) They als allow serum to escape and by ate the necessity fo cutt holes in the graft It does not matt r if a few islands f the riginal skin are pre ent ben th the g ft When s turin s om pleted the wh le rea is ain spr kled lightly with sulfanil mide crystals a gauze sponge satu r ted with sterile glycer e s pressed down firmly on the graft and b lky gau e dr ssings are ap pl ed Mode te p ure is ma nta ned w th ad hes e str ppin or el st c ba d ge We ha e f und speci l dres ngs unnecessary Mech ncs w ste too l mpy d gives n une en p es ure Th outer lres in s a removed n 5 days and if the wound s clean a d dry it is edressed a d after n the 5 d ys the s t es ar remo ed

If the details o ltned ar f llowed a 100 per cent tak of the graft should be bt med Heal ng time i greatly short ne l d i c m f r t i m mized nd the c smetic esult s cellent in this method of t eatm nt

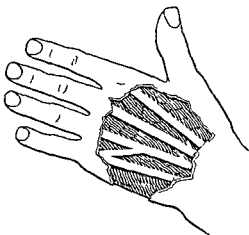
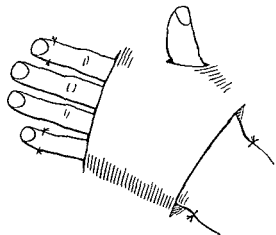


Fig 3 a l f t W u n d f t h d u m f h d l v g
t s o t d p o d I f t h t d t f m t y d
l g a m y b p e t d w t h p p l a d d f m t y
A p t l t h k g f t w l t g g o d f t u b
g h t A f t g l c l a n g d d e b d m t t h h d



h a s b e p l d p o c k t f l a p t h b d m T h f p
t h u c k d m m f t N t h h t t
p t m m t f t h b d O d f t h f l a p d
v i d d 7 t d y t h t t 7 d y s T h b
d m l d f t d w t h a p t l t h k a s g r f t

SLICING WOUNDS OF THE FINGERTIPS

Slicing injury of the fingertip is common in those who work with knives sharp-edged tool or machinery. If the wound is allowed to heal spontaneously it means healing by granulation and almost always results in a tender or painful scar. Many patients will return later requesting amputation for relief of these symptoms. If primary closure is attempted it is necessary to shorten the bone in order to secure an adequate skin flap.

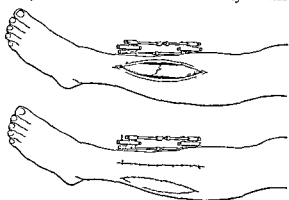
Immediate application of a thick skin graft to the wound will give rapid healing, good function, and will avoid further shortening of the finger (Fig 2). The operation is a minor one and can be performed in the office or dressing room under procaine block anesthesia. The whole hand is thoroughly scrubbed. Usually very little cleansing of the wound is necessary since it is a smooth cut with free bleeding. Bleeding can be adequately controlled by pressure. The graft is cut from the flexor surface of the upper forearm in the same manner as a large pinch graft. A pattern is unnecessary for such a small graft. In females it may be desirable to use some portion of the anatomy other than the forearm. The graft should be full thickness at the center with a little of the subcutaneous tissue and taped at the edges. It is sutured into position with fine interrupted silk. Sulfanilamide powder is sprinkled about the wound, a glycerine gauze dressing applied, and the finger bandaged under slight pressure.

Rapid clean healing usually follows the procedure and a successful take may be expected in over 80 per cent of wounds so treated. Pain is

usually disappears after the graft is applied and whether the graft survives or not pain is greatly minimized in contrast to that seen when the wound is left open. Indeed this is true of nearly all wounds treated by skin grafting. A very painful burn will become almost painless once it is covered with skin.

WOUNDS LEAVING EXPOSED TENDONS

Injuries in which the tendons are left exposed always lead to considerable disability unless



F 4 b o C o m p o d f t u f t h t b i a d b b
l T h w d m t c u l l y l n s d d t h f a c t
d e d d d i c t h z t l t e c e s s a r y t l a g
t h d t c a r y t t h p o c d M t m p t t
l f t t t m t t h g h m c h a l l
g d d b r i d m t b b l B e c a s e f l l g t h p
t w d l d t b e l s e d t l l a x
w m d b e l o w T h p e w d t t h t f t h d
r y i n w t h e n d w t h p u l t h k e s k
g r a f t f r o m t h t h g h

promptly treated. The exposed tendons either slough or become embedded in deep catarrh. The hand is particularly vulnerable to such injuries especially the dorsal surface where the coverings are thin.

Full thickness skin grafts are essential to good function in covering tendons. The grafts should carry a small amount of subcutaneous fat and areolar tissue. A free graft of this type does not take well when placed over exposed bone or tendons. A pocket flap should be used for the hand and a pedicle flap for the ankle, foot or knee.

For the sake of brevity we shall discuss one injury of this type a wound involving the dorsum of the hand (Fig. 3). Meticulous surgical cleans and debridement are carried out and the injury is converted into a surgically clean wound free of devitalized tissue. The preparation is essentially similar to that described under deep scraping wound. Exposed nerve filaments should be carefully preserved.

For the donor site an area is selected in which the hand will fit comfortably without tension. The ante- or abdominal wall or thigh is suitable. A flap is raised of sufficient size to fit over the hand and cover the wound. The hand is placed in the pocket and sufficient sutures used to anchor the flap firmly to the hand (Fig. 3 b). A few additional stout sutures are used to anchor the hand to the abdomen or thigh. Firm anchorage is most important. Movement of the hand under the flap is probably the greatest single factor in preventing a satisfactory result. Bulky dressings and adhesives stopping give additional immobilization when the operation is completed.

One end of the graft is cut free in 7 to 10 days. The free end is trimmed and fitted to the wound and sutured with fine silk or demal. The other end is freed in 12 to 17 days and the final stages of fitting and suturing completed. The donor site can usually be closed but if necessary split thickness graft may be used to cover the defect.

Approximately normal tendon function may be expected following this method of treatment. The procedure is equally applicable to secondary sloughs following injuries or burns provided infection is cleared up before a graft is attempted.

MISCELLANEOUS

In compound fractures of the forearm it is sometimes impossible to close the wound following operation. Relaying incisions must then be made lateral to the wound in order to bring full thickness skin and fascia together over the bone. The relaxing incisions instead of being left open to granulate in may be covered with a split thickness graft (Fig. 4). The technique of application is similar to that described under scraping wounds. A graft of 0.014 inch is satisfactory. In this manner rapid clean healing is assured with minimum disfigurement.

In a dirty crushing or deep lacerated wound it is sometimes advisable to excise the whole area thus converting it into a clean surgical wound. Following excision it may be difficult or impossible to bring the edges to either a partial thickness graft taken from an adjacent area may be used to convert this into a closed wound. The technique is similar to that described except that in a deep or of greater care must be taken to bring the graft into contact with the underlying base. This contact is accomplished chiefly through suturing with fine silk and by the use of pressure dressings.

SUMMARY

Through the use of skin grafting many open wounds can be converted into closed wounds and thus primarily healed. Primary healing means a tremendous economic saving as well as decreased pain, improved function and superior cosmetic results.

To be successful all dirty wounds must be surgically clean before grafting is attempted. Grafts must be placed and held in firm apposition with the underlying tissues. The most common causes of failure in skin grafting are (1) infection (2) blood or serum pockets beneath the graft (3) inadequate contact between the graft and its bed (4) improper inadequate coverage of the graft so that slow movement derails the healing process.

A variety of injuries are discussed in some detail and the methods of grafting best suited to each type.

DICUMAROL THERAPY IN POSTOPERATIVE THROMBOPHLEBITIS AND PHLEBOTHROMBOSIS

WILLARD H PARSONS M D F A C S V k s b g M s s s p p

THE outlook in postoperative pulmonary embolism which was formerly regarded as an unpredictable unpreventable and highly fatal surgical complication has been completely altered within the last few years for two important reasons. The first is a changed concept of its etiology. The second is the introduction of effective prophylactic and therapeutic measures including ligation and division of the femoral vein and more recently the use of dicumarol.

It is still true that in all surgical experience there are few more ghastly accidents than the sudden death from massive pulmonary embolism of a patient who until the fatal episode has been progressing to an uneventful recovery. There is no longer any justification however for the former concept that the catastrophe is a literal bolt from the blue. It is not. It is now realized that in probably 95 per cent of all cases postoperative pulmonary emboli which term name fatally have their origin in thrombosis often without an associated inflammatory factor of the superficial or deep veins of the lower extremities.

Both the incidence and the causation of postoperative thrombi are still matters of debate. On the surface at least geography seems to have something to do with the incidence. Thus Allen Linton and Donaldson report a very high frequency in Boston while Ochsner and DeBakey report a considerably lower incidence in the South. What is important however is that wherever the condition has been properly studied the incidence has always been found to be much higher than as once believed or than is believed and taught in many circles at the present time.

The incidence of postoperative thrombosis regardless of the locality is almost certainly related to the proportion of necropes secured. When ever the proportion is high there is a correspondingly high incidence of thrombosis of veins of the lower extremities and of pulmonary infarction and fatal pulmonary emboli. When the percentage of necropsies is low the incidence of venous thrombosis and pulmonary infarction and of fatal pulmonary emboli is correspondingly small.

For the past 5 years I have been able to obtain necropsies in about 75 per cent of all fatal cases on my own surgical service and I have observed—on more than one occasion to my amazement and chagrin—a relatively high incidence of pulmonary embolism and of antecedent venous thrombosis. My experience in this respect I am sure is not unique.

Although there is no general agreement as to all the causes of venous thrombosis certain causes are established including (1) improper handling at operation of the viscera and their venous supply (2) confinement to bed with consequent inactivity of the limbs and in turn slowing of the circulation (3) some alteration of the normal blood clotting time the nature of which and the reasons for which remain to be elucidated. The complication is most often observed after surgery particularly upon the pelvic organs and pelvic infection either antecedent to or subsequent to operation unquestionably is an important cause. It should be emphasized however as the following case illustrates that a nonpelvic origin is not infrequent and that surgery does not necessarily precede the development of pulmonary embolism.

C M J H (H 3 873) o w m 5 y f
ag b m t t d t b t t l t h y d t m y f t x c o d l
g t N m b 943 Sh w d s c h g d g o o d l
d t 7 d y l t f t t f l y N b
m l t e w b d t t t h f i t p t p t e
x a m t N m b 5 b t t t h s d m t u
N m b 4 l l g f t h l f t l o w t e m t y w s
t d d b y D e c m b l t t h r m p h i b u s
h a d l p d R t m a s w n s t t d d
f l l d b y c m p t e c w p t f d l
d m w h h l d s a p p e d f t p r a l b l o c k
f t h f i t t f t h l f t m b g l r a l M h
3 d M h 944

C D W S (H 4 6) g m l y f g
a s f i t s e A p r i l 8 944 o t h m d l r v f d
K P k s F t h p a s t m t h h d h d h d d
h t l d t h p o d t u t h t d h d f t
4 p o d R o e t g l o g m t f t h h t
h d b l t l f d d p l m y t b u l o s d
m t f t h p t m l e d d f t h a r i l A p r i l
9 h l t h w a i t g o o m t h p t t d d l y d
l p e d y o s d d y s p e a p a s s e d t t a t f h o c k
a d e d h r s l t h u g f a i l d t r e s p o d t l l
t h r a p e t m a s u r N e c p s y n f i r m e d t h d a g o s f
t b l a t l p l m n a r y t b e c u l o s d l d
t h m m e d t c a f d e a t h t b e p l m n a r y m b o l m
t l o e a l d t h r o m b o s i s f t h r i g h t f m r a l d
m l i p l p l m n a r y n f a r t s f m p m b o l

From the V k s b g C l V k b r g M s s p p R d b
v i t a b e f r e t h P l C o t y M e d I S o c i t y 4 g u t s 944
t f C o m b M i s s i s s i p p i

Thrombosis (whether the bland thrombosis of Homans or the phlebothrombosis of Ochsner) should be borne in mind as a possibility following any operative procedure and should be immediately presumed to exist if several days following surgery there is unexpected or unexplained low grade fever or if there is tenderness in the calf of the leg on dorsiflexion of the foot (Homans sign). These two phenomena are sufficient for diagnosis. Phlebography is not essential; it is sometimes useful but it may be very unwise.

When thrombosis or thrombophlebitis has been diagnosed or is seriously suspected, exploration of the femoral vein is a wise precaution. If pulmonary infarction has developed, it should be carried out without delay. Although a highly effective procedure, exposure and exploration of the femoral vein with removal of the clot by suction are minor in their scope; present no surgical hazards; give rise to no complications; and can be safely and quickly carried out even on a very ill patient.

DICUMAROL THERAPY

With this plan of treatment itself of fairly recent development should be combined the administration of dicumarol controlled by daily determinations of the plasma prothrombin time. The effectiveness of these measures is illustrated in the following case report.

C 3 R H (H 5-0 J) white female 39 years
t mpt l hy t m f t r i fib l my m
and cal os J 8 944 Sh d sch g d
good d t J ly ft t f t y b t
w hosp taliz d J ly 3 b f p th upp
th d f th l ft th b just b l w p p t l m t o
c t d w th l ght ll g d l ght dd g f th k
th ft t d Th l ft m l m
d t ly spo d d p d l t 8 h l ght
m d d th w th l g t d d d d d
D m l th py d l b t y t l d
n t d t l J ly d th p u t w d sch g d
th f l w d y mpt l ly d

Thrombosis of the venae cavae of the lower extremities can be prevented in most cases by the administration of dicumarol at operation and following operation. At operation on all major vessels should be non-traumatic and the heel should be supported to prevent the venous supply. After operation, the circulation should be maintained in the lower extremities by keeping them warm by the use of electric blankets or by the use of the bicycle apparatus and in older patients by the application of nongelatinous bandages. The prophylactic use of dicumarol is of value as the following case report indicates.

C 4 M R H (H 5-0 J) white male 39 years
b m t d t t t l hy t m f t

fib l my mas J ly 944 p phylacti ppe dec
t m y was l perf m d Beca f alkly tear
f l f p lm ry mb l m f m h i h w l se l u
h d d d f l l g p e t d m l g f u r d
d y b f p t th d y f p e t d f 3 d vs
ft rw d R ry was mpt l ly t u l

The case is somewhat similar to a case in Zucker's series in which dicumarol was used prophylactically because the patient had a previous history of thrombophlebitis in pregnancy. The patient had died of postpartum thrombophlebitis and a second sister required amputation of a lower extremity for the same reason.

The discovery by Schofield of the part played by spoiled sweet clover in the hemorrhagic diseases of cattle was followed by the isolation and synthesis of its active principle, dicoumarol, and by the prophylactic and therapeutic use of this principle under the commercial name, dicumarol. Although reports in the literature are still few, the evidence seems no doubt of the effectiveness of this agent. Barker and Hasselbates from the Mayo Clinic who tested it prophylactically on 143 cases during the period in 1943 published their results in 497 cases. In 75 of these cases on the basis of exact statistical data, thrombosis or embolism might have been expected to occur and 4 fatal ties from embolism might have been expected. The conditions however developed in only 4 in the cases none of which terminated fatally. Zucker has recently reported 8 cases in which dicumarol was used therapeutically, including 9 instances of thrombophlebitis of the lower extremities and 2 instances of postoperative pulmonary infarction. All of the patients made complicated recoveries.

The rationale of the form of therapy reduced to its simplest terms may be stated as follows: Thrombosis is a subsequent embolism resulting from the other etiological factors that led to occur because the mechanism of blood clotting is too efficient. The use of dicumarol, which attempts to educate the efficiency of the mechanism to the lower limit of safety by the administration of an anticoagulant, and corrects the conditions, whereas the tamper with the plan of the therapy is to administer a small dose of 0.01 to 0.03 milligrams of dicumarol followed by daily doses of 0.01 milligrams as long as necessary to maintain the plasma prothrombin time within 3 to 60 percent of normal. Observations at the Mayo Clinic by Hurn and her associates indicate that thrombosis will almost certainly not occur if the prothrombin time is longer than 27 seconds and that the administration of dicumarol to occur after the administration of dicumarol if the prothrombin time is less than 60 seconds.

Their policy is to use 35 second as an arbitrary standard when the prothrombin time is longer than 35 seconds dicumarol is administered and when it is less the drug is omitted.

Zucker call attention to the importance of the tendency (slope of the plotted curve) of the plasma prothrombin time which is equal to the importance of the absolute level. The time may be excessively and dangerously lengthened if an additional dose is given while the percentage of normal is decreasing but there may be escape from the desired range if a dose is not given while it is increasing.

Dicumarol for either prophylactic or therapeutic purposes is absolutely contraindicated in purpuric disease of any type in blood dyscrasias with a bleeding tendency in renal insufficiency and in hepatic disease with which a prothrombin time deficiency is frequently associated. Even when these contraindications are observed however bleeding is always a possibility. It occurred in 47 of the 497 cases reported by Barker and his associates though in only 18 of these in all of which it was readily controlled by transfusion. It was apparently related to the anticoagulant therapy. In Zucker's series of 18 cases 5 patients presented microscopic hematuria in 1 instance associated with a petechial rash. In the latter case the rash developed while the prothrombin time was 18 per cent of normal and in 3 of the other cases hematuria developed while the prothrombin time was less than 30 per cent of normal.

The speed with which the prothrombin time may be extended to dangerous level is well illustrated in a personal case

C S C O S (H 4 8) h t m 4 3 f
 b m t d t B h p l t y J 7 944 f
 p f l g l f t d t g u n a h R y w
 m o o t h t l J w h d d l l p o c d
 t d t h p d l p d p i w t
 A l t h h y o c l f s t d d a p
 b l t y t h p f p l f t b t h l t
 d o r p h d t d t t h b t m d
 d a g o s l p l m n a y f c t m d
 d m l t h p y t h f b g t h t
 d o s a g f 3 m l g r m O t h f l l d y J m l
 g m t k d m l l g m w g J 7
 t h p t s p l m p t h m b t m d 5
 (m t s d) J 6 d 36 (m l
 5 d d J 7 A l t h h f t h m d t
 d m t d t h p l m p o t l m b t m o s t 46
 s e d (m l t d) J t s d (m l
 3 d s J 9 d t d (m l s d)
 J 3 t m A t 4 (t h d t t b
 t m t r s (0.4 m g m) f h y h (t h t t m k
 A b b o t t R B y t h l m p t h m b
 t m h d f l l t 45 d (m l 7 d) d 3
 h r s t t h d f l l t 3 d (m l s d)
 d t y f t t h p t t l l p d f t d m f
 t h l f l g a s d m t t d O t h f l l g d y d m

w d f n i t d w a t d t h t d t h
 f t h l f t f m l T h w p d d
 d J 8 l t 4 h d l g t h w m d d
 t h w t h l g a t d d d d R y f t t
 t u n f t h d g l y p l g d p t h m b t m
 w u t f l d t h p t e t w d h g d g o d
 d t n J u l y 4 944

The speed with which the prothrombin time in this case rose to dangerous levels and the rate at which it continued to increase for 72 hours after the drug was discontinued suggest that the patient was particularly susceptible to dicumarol. The even greater speed with which it returned to a safe level after a single administration of synthetic vitamin K suggests that this method is probably even more effective than transfusion which is usually advised.

It should be noted that in this case the thrombophlebitis followed rather than preceded the development of pulmonary infarction or more correctly became evident after the development of pulmonary infarction. It should also be noted that it became manifest while the patient was under treatment with dicumarol. Zucker who recorded a somewhat similar instance regards the development of the venous thrombosis under such circumstances as evidence of the safety of dicumarol therapy though it also he believes raises the question as to whether hypoprothrombinemia achieved by dicumarol is sufficient to inhibit intravascular clotting.

Dicumarol therapy is potentially dangerous and the necessity of laboratory control by daily plasma prothrombin determinations cannot be over emphasized. The possible risks are illustrated in the personal case just described (Case 5) and are more tragically illustrated in the fatal case reported by Shleivin and Lederer. Their patient a white woman 79 years of age was first seen 4 weeks after she had been admitted to another institution for thrombosis of the right retinal vein for which she was treated for 21 days with daily doses of 100 milligrams of dicumarol. During this time no plasma prothrombin determinations were made although the coagulation time was reported as 20 minutes. Dicumarol was discontinued 4 days before the patient was first seen by Shleivin and Lederer when bleeding from the gums had occurred. It had persisted and had been associated for 3 days with hematuria.

The patient was given 7 transfusions after the first 3 of which coagulation was temporarily controlled. The plasma prothrombin time which was 60.6 seconds (control 12.1 seconds) when the patient was first seen rose to 360 seconds plus (control 13 seconds) on the 8th day of hospitalization after the 4th transfusion and was 84.4 seconds (control

12.8 seconds) when it was last determined. Acute left heart failure developed after the 2nd transfusion and anuria on the 7th day was succeeded by incontinence, lethargy and coma. Death occurred on the 14th day. At this time there were ecchymotic areas on shoulders, hips, legs and about the anus. The outstanding feature of the necropsy findings was marked engorgement of all blood vessels except the larger trunks; it was most pronounced in capillaries, arterioles and venules.

This case apparently the first of the kind to be reported carries its own lessons and makes clear that too many precautions cannot be taken while dicumarol therapy is being administered. For this reason it seems well to mention the recent warning by Hurn and her associates that thromboplastin is distinctly variable under certain conditions and that each new batch regardless of the similarity of preparation should be checked since the results of the prothrombin time test depend to a great extent on the activity of this agent. As these workers point out, when the Quick test was first introduced all information desired was whether or not the prothrombin time was prolonged. With dicumarol therapy, however, the patient's safety depends upon knowledge of the exact amount of deficiency; hence the necessity of checking the activity of thromboplastin used in the test.

On the whole, dicumarol is a more practical drug for general use than heparin, which was formerly the only effective anticoagulant available. It can be given by mouth whereas heparin must be given intravenously, which is always a disadvantage for the patient and which is often inconvenient in these days of shortages of hospital personnel. It is much cheaper than heparin, which is almost prohibitively expensive for the majority of patients. It is also safer than heparin in the opinion of some observers because of its comparatively low toxicity. On the other hand, dicumarol requires from 4 to 36 hours to take effect whereas heparin acts almost at once when heparin

that in a certain small proportion of cases heparin rather than dicumarol is the preferred drug.

SUMMARY

Pulmonary embolism is preceded in the great majority of cases by thrombosis of the veins of the lower extremities which can usually be prevented by the proper precautions at operation and afterward and which can be treated by removal of the clot from the femoral vein with subsequent ligation and division supplemented by the administration of dicumarol. Dicumarol is also a valuable prophylactic measure.

In spite of its effectiveness, dicumarol the essential effect of which is to lengthen the clotting time, a very dangerous agent which should never be employed without adequate control in the form of daily estimations of the plasma prothrombin time.

If the plasma prothrombin time becomes dangerously lengthened as may happen even in properly controlled cases in a subject peculiarly susceptible to the drug, the administration of a vitamin K preparation or transfusion is indicated and seems promptly effective.

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THE EFFECT OF DIHYDROTACHYSTEROL ON CERTAIN TOXEMIAS OF LATE PREGNANCY

WALLACE SHUTE Capt n R C A M C and EVAN SHUTE B A M B F R C S C
Lond C nad

PROPHYLACTIC control of pregnancy toxemias in the last dangerous trimester has proved a very complex problem. No treatment can be adequate however ingenious if it fails to eradicate their cause. Etiological exploration to date seems to have progressed along four main approaches: (1) endocrines (2) placental toxins (3) kidney factors (4) chemical or organic poisons from other sources. Prophylaxis has not waited however for a completed knowledge of etiology and many workers have stressed the value of vitamins and better food in preventing toxemias or alleviating their symptoms.

In 1910 Mitchell made the observation on empirical grounds that an inadequate complement of calcium was a predisposing cause to the toxemias of pregnancy. Morel and Rathery found that a lowered detoxifying function of the liver followed parathyroidectomy and the resultant derangement of calcium metabolism. The liver of course is one of the principal sites of attack in eclampsia and other late toxemias of pregnancy.

Lopez found in his toxemia series that prompt improvement followed injections of Collip's parathyroid extract with diuresis and a decrease in blood pressure, edema and subjective symptoms ensuing. In none of these was there any significant coincident increase in the blood calcium level.

Richardson reported complete symptomatic recovery of two pre-eclamptics who were given parathormone intramuscularly and calcium and viosterol by mouth. Blood pressures of 150 and 160 respectively dropped to normal level and even a two plus albuminuria disappeared rapidly.

Daly claimed similar dramatic results with the oral use of tablets containing a calcium salt combined with the intravenous administration of a corresponding preparation. He made the interesting additional observation that only 11 per cent of his treated series were delivered prematurely as against 63 per cent of the control.

J. C. Brougher reported a series of 88 to 90 patients occurring in a total of 1000 pregnancies. Of the 341 blood pressures of 50 to 100 a day up with varying degrees of ankle edema, albuminuria and definite toxemic symptoms. The

remaining 54 had pressures from 140 to 150 only slight ankle edema and traces of albumin—no other toxic symptoms. Parathormone in 1 cubic centimeter doses was used to elevate the serum calcium. In each case diuresis occurred with prompt loss of edema, general weight loss, lowering of blood pressure and a recession of toxic symptoms.

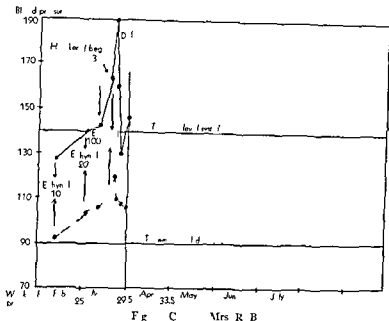
Theobald treated 50 healthy women less than 6 months pregnant with daily doses of 20 grains of calcium lactate as well as 11,000 international units of vitamin D. Only 7 of these developed hypertension as against 17 in a group of 50 controls.

Similarly Mendenhall and Drake found in a group of 188 women given calcium orally that toxemia developed only twice (1 per cent). In a group of 230 controls fully 30 became toxic (13 per cent).

It has been shown (Albright and associates) that though parathormone increases phosphate excretion and mobilizes calcium, it does not aid in calcium absorption. Conversely dihydrotachysterol (A.T.1) plays an active role in increasing calcium absorption from the gastrointestinal tract although it is less effective than parathormone in promoting phosphate excretion.

By means of blood estrogen estimations we have found (12) that toxemic women fall into two main groups, namely: (1) those exhibiting a high blood estrogen level characterized by either a tendency to abortion or miscarriage or abruptio placentae or premature labor; (2) a much smaller group with normal or low blood estrogen values who being true pre-eclamptics may run almost the whole gamut of pregnancy very well to all outward appearances only at the end to fall over the precipice of convulsions. In the experience of the authors women belonging to the first group very rarely convulse; the latter are always potentially capable of doing so.

The great majority of the first or high estrogen group of toxemic women respond to vitamin E prophylaxis satisfactorily throughout pregnancy. (1) A certain small percentage of them however either do not respond perfectly at any time to such treatment or seem to escape from such



control at the end. It was for the management of this refractory and difficult group that the treatment outlined in this paper, the use of calcium and dihydrotachysterol was thought of by one of us (W. B. S.).

DATA

There were 4 patients in the group studied of whom 38 were of the high estrogen type and 4 of the low estrogen or true eclamptic group. Each of these patients was given orally a daily dose of 20 to 50 grains of calcium gluconate or calcium dihydrophosphate when the tocin was not to escape from vitamin E control. To promote maintenance absorption of this calcium dihydrotachysterol was given by mouth at the same time in the form of hylakerol (W. B. S.). In the early cases blood calcium studies were performed repeatedly both before and during administration. However, it soon developed that with the dose of 20 grains a qualitative urinary calcium estimation using the Sulzow's reagent () was quite adequate and therefore the blood tests were discontinued frequently.

The Sulzow's reagent made a final 0.5% calcium gluconate solution of 5 grains per 100 cc. of distilled water to 50 cc. of urine.

To test for urinary calcium equal parts of the reagent and urine were mixed. If a milky reaction promptly followed, calcium was being excreted in excess. The mixture held in the test stand

under to recognize any diminution of calcium. In the latter we have used the latter has often been a cloudy mixture and some sediment but never a fully milky reaction indicating hypercalcemia.

CASE HISTORIES

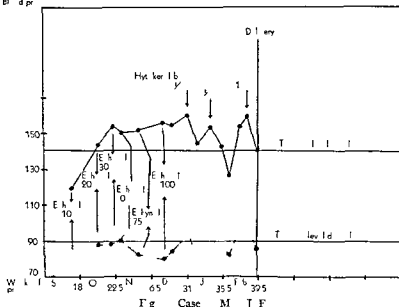
The detail of few illustrative cases is given here.

SUMMARY OF RESULTS

Class.	Number	Result		
		Improved	Stabilized	Fatal
H. B.			6	
L. (true eclamptic)				
Total				20

C. M. R. B. Th. m. g. d. 3 years h. d. la. t. m. tru. t. S. p. t. rub. 5. 943. Sh. g. h. t. r. y. f. ul. lamp. with. h. th. p. ancy. h. ch. h. d. d. t. 7 m. th. m. f. ung. 5 d. O. F. B. ry. 944. wh. first. h. had. blood. p. ss. f. 3 g. ed. m. lb. um. Bec. se. blood. t. g. l. l. p. h. t. g. m. f. ph. n. l. p. e. d. y. On. M. ch. h. p. ess. ur. had. j. m. p. t. 4. d. h. as. g. t. m. lb. r. am. of. ph. n. l. d. gr. ins. f. d. l. c. m. ph. phat. h. f. rth. I. k. tum. mp. m. th. d. ed. d. th. rel. h. as. g. b. tum. t. f. hy. tak. j. p. e. d. y. as. ll. Sh. h. d. pl. lb. um. n. By. th. 27 h. p. h. d. j. m. p. t. 4. h. lb. m. ur. as. 3. p. d. h. d. m. t. t. h. osp. t. 11. b. s. v. r. u. n. On.

Bl d pr



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 h p w 9 / d h lb m
 h l l gram p e t O M h 3 b t m t f
 h y t a k l d s m l l g r m f phyn l p e d y h b l d
 h e s w 4 / d h lb m r h d d d
 h 5 m l l g m p t h t m d Th s l k
 h t h t t w l y g t u O t h 3 d h
 h 8/98 d h l b u m l y t Sh w t
 h m th 7th O M ch 3 h l b u m w p
 h g u t p l d h p t 46 / 6 O t h t m
 h b o I h h d l d b y g h g p o d g
 h e s Th p l t f l l d o o h g t h m
 h t e d f t u l l y 3 ch s q
 h s e m b l g r n l p l t On A p l h p
 h / O A p l t t / 9 O A p l 3 t
 h t l l d t Sh h b l l f t h l q l l y
 C M J J p r u m g d g d 34 y Sh
 h first see S p t m b e 94 H l t m t r u l d t
 h d b e M y 6 H g h t 8 p d A h h d p o t b l o d
 h e s t g h t g m l l g m f phyn l p e
 h d y H blood pre r e b e g t l u m b t d l y d p t
 h u n t d e s f phyn l Sh d l p e d r y m k d
 h u t n n t d e s t o o d w l m t b l t l k b y
 h J u a r y 943 h e n h p a s 6 o4 d h
 h w g h t a s 38 Sh t i l l h d e d e m l b m n
 h H e r b l o o d c a l m 97 m l l m t r s p t Sh a s
 h t h g 5 m l l g r a m f c a l m g l t d b
 h t u m t r s f h y t k l p e d y Sh h d h d o o m l l
 h g r a m f p h n l p d y f 3 k p n t t h d t h
 h d o s e m t a d B y t h 9 t h p e s h d d p p e d
 h t 44 / 8 h g h t h d g d h l p o d d t h
 h h y t a k r o l a c u t t 3 b t u m t p e d y O
 h F b r u r y 6 h p e s a n l y 64 O F b r u r y
 h p r e h u d t g t 6 o o d h a s g
 h c u b t u m t f h y t a k l p d y L b o b g
 h p o t a c o l y F b r u r y 7 w t h p e s f 4 8
 h t r a f l b m M t 8 h l a b o g l
 h x b g 7 p o d 7 e s w d h e d b y t l t f c e p s

Th p l t a h d t w h u t m g l i n f t b t
 d 3 t u m t d i a m t e s p t u l y Sh m d
 t t f l m r y O M y 6 t h t m h w d
 h f l b m O M y 9 h p w 4 / 6
 h t m t t u Sh h m e d w l l
 C s 3 Mrs D K F r t p g n c y m w m f
 y H l t m s e h d b g u n J 944 Wh
 first S p t m b e h b l o d p e s w a s 4 / 9
 d t h w a s l b m A t h b l o o d e s t
 p o t h w a s t m t t u Sh h m e d w l l
 g r a m p d y t h p g u p h y n l D p t 5 m l l
 b 3 Th t i l l d m l f m O
 F b r u r y 8 t h t t u w h g d g f
 l m g l t n d b t m t p e d y f
 h y t k l b g u n O F b r u r y 8 h p h d
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 H f h p b g t n g m d 74/9
 th r y f i n t t f l b m M h 3 H
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 d e d d 8 p o d g l w d l d n (?) h r s A t
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 first J r y 6 944 h e p e s s w 74/9
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 p o t a h a s g n p h y n l t o n B y J l y 3 h
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 p l l b m n h p e s s h d j m p e l t 46 / 6
 t h w m h l g e d m m o d t h y d m h
 t h f g f c a l c i m g l n a t d 3 b t u
 m t r s f h y t k l p e d y b e g u f d a v s l t
 h e d h g e d b t h l b m l y
 r y f t t d h p e s s h d f l l t 4 / 93 O
 t h t h t h p e s 4 / 9 b t t h l b m n w
 p l Sh e n t t l b o p o t a u l y t h a t d y d
 6 h r s d l e d g u l e i g h t g p o d s 9 e s Sh

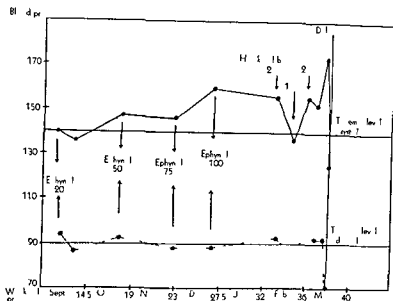


Fig 3 Case 3 Mrs D K

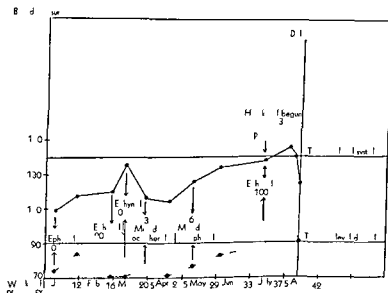


Fig 4 Case 4 Mrs W B

h d t f l e c r y O S p t m b 9 944 h by Dec m b e t h b l d p e s h d f l e n t 6 44
 H o d p 8/0 Sh h b e e l l Th h b g t b l d l i g h t l y H p h y n l d o s e m
 C 5 Mrs A J H g d 3 y h d h d t Th h b g t b l d l i g h t l y H p h y n l d o s e m
 x p l a n d t l l b t t r m Sh t d t h h l d b t p e s h d r i t 66/06 Th f h e p h y n a l
 h h b d p r m m p l r y d f t b o t h d s a g a s d t 7 m u l l i g r m S d y l a t b p r e s
 m b d m r p h l g 3 Th m g r t l y m b l o o d p e s 34/96 d t h l O n M y 5 h
 p e d b y p h y n l (4) d h p m p t l y d H b l o o d p e s 5/9 t h s o m l e g e d m h e r
 l a s t p e r i o d b g O u t b 943 W h f i t r u n l e a d c u b t u m t r s f h y t a k l d
 N m b e 3 h h d p f 66/8 l t h g h h g r a p e d a y f l m g l t w b e g u n B y
 h d l b m e d m H b l o o d e s t b e J h p e s s h a d f a l l t 44/84 O n J l y t a s
 p o t i h w p t l a g d f p h y n l t d 46/9 t h m o d t l g e d m a n d a l b u m i n u r i a L a t e r

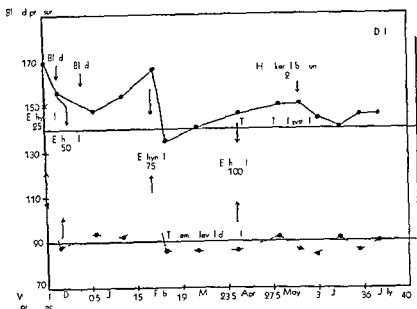


Fig 5 Case 5 M A J H

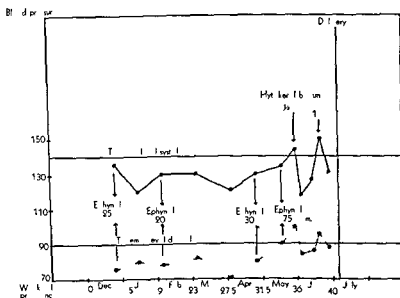
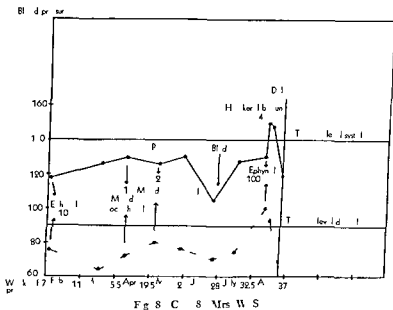
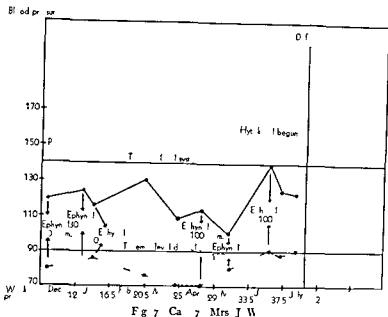
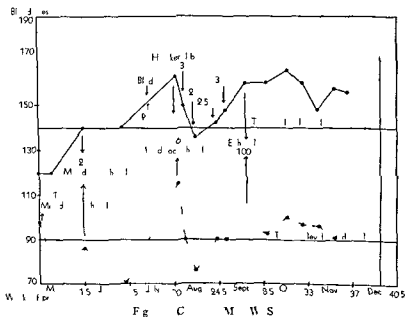
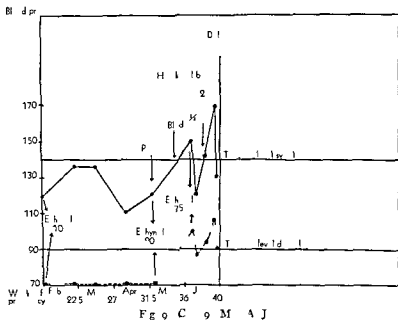


Fig 6 Case 6 Mrs R. L.

l ed A gut 5 h h p ss as 46/96
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 J ry 6 045 54/ Sh has bee ll th rw se
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 t Sept mbe 3 94 i ly h h d h d
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 38/ 6 h un as l h b d ed b th as
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 despt 75 mill gram f phyn l pe dy H as
 cl a d th edem T l dy l t 00
 milligram h b ed 44/ 00 b t till h d d m
 lb m na Sh as thencef th g en / cub t
 m t fhytak l pe dy as llas gr f l um
 gl co t A eek l t h pes h d fall t 3/84
 O J oth pes ose dd lyt 5 / 96 th
 m un l leg ed m b th n was l f lci m d
 lb min n Th dose f hytak l w d bled I
 eek th pes. re as d t 3 / 88 Sh d ed

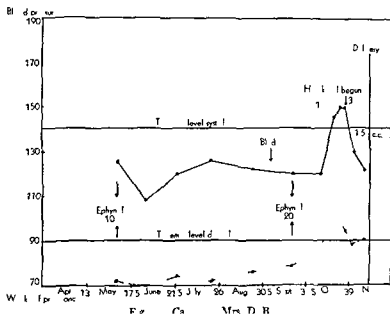


med lly J ly 8 d h d y d l ry in h rs f m l l e r a m f p h y n l p d y A h p a i n t u n e d t h u s
g l w h u n 7 p o d Th pl ta d d g r d l y d O n J h p e s s u h d
m l H b l d l m l b o h w a s m i l t t t h d m d p t 5 m i l g r a m f
g n p 7 S h h b r m l i n p h y l p d y S h t h f g i c u b t e
C 7 M r s J W d 3 y s h d b y 5 3 l d m t f h y t a l d l e u m g l t g r p e
d m d b l t h t h h i d A l p o d I t t d y I 7 d y s h p e s h d d p p e d t 4 9 8 d h
h w e d m p l t b l t l t b l o c l - b t h i n c l A w k l t h p e s g l g t
9 4 d m m d t l y H l t p d b e g O t b e 6 J l y 7 p o t a n l b d l d r m l g t f 7
t n n d h D e c m b 7 h h d p e s f p o d 8 e s f t r y s v l b o f h r s T b
t r n e d m l b m b t d d h l i h t p l t a s w a s r m l O n O c t b e 6 9 4 3 h b l o o d
t n n d i s t B e c f t h w t p t p s s a s 9 8 / 7 S h h b e e w l i n



C s 8 M W S g d y h d h l t m
 Dec bc 4 943 lt h fix t p g y Wh
 first se f bru ry 3 1944 h h d p es f q 6
 ed lb m A h bl od t g l l p
 d h had h d t p h g¹ soo p¹ f
 m ed t ph l (P D) p d y Th t k t
 t k t m F h bl d J 3 H w t m
 k t p r d th q kly S dd ly A gu t 8 h h b t d
 p es f 3 oo d m h l g d m lth gh h
 as lea Sh w g oo m lgram f phyn l

pe d y th caft th b be ft Th f
 A g t h g n 4 cub e tum t rs f hyt k l
 d g h d f l m gl t p d y I 5 d y s h
 p h h d f l l t 48/9 Th un d m b t
 f l um O A gu t l bo bega po t ly d
 h d l ed 5 po d q boy h Sh h d
 blood p h ed o ly t 8/ t th t m d cath t n
 A gu t as 3 / H d t on h be rm l
 th t tum



calcium that to produce an elevation in blood calcium an exceptional dosage is required. More over as Klatskin points out any excess of calcium or of phosphorus absorbed is excreted so rapidly that transitory variations in blood calcium level are rapidly leveled off. Reed states categorically that there need be little apprehension for example about administering amounts of parathormone up to 150,000 international units for indefinite periods of time.

How then does dihydrotachysterol combined with calcium affect the toxemias of late pregnancy? From the aforementioned findings it appears that it leaves true pre-eclampsics clinically unchanged and benefits only some toxemic patients of the high estrogen group. Most women in this latter group respond fairly satisfactorily to the action of vitamin E as we have shown elsewhere (15). But dihydrotachysterol is of great value in that important small fraction of the high estrogen late toxemias incompletely controlled in this manner by means of vitamin E.

No attempt is made at this time to explain the underlying mechanism of combined dihydrotachysterol and calcium therapy in the toxemias.

Its principle impact seems to be directed mainly upon the pressor factor. At least this treatment should be safer than parathormone in controlling the calcium factor in late pregnancy toxemias.

SUMMARY

The effect of combined dihydrotachysterol and calcium therapy is demonstrated on a series of 42 toxemias.

This therapy did not improve 4 true pre-eclampsics but definitely helped 4 per cent of 38 late toxemias of the high estrogen type which had not been controlled by vitamin E.

3 This differential response lends further support to our previous classification of the late toxemias.

4 This therapy appears to be most effective in lowering blood pressure and less in the control of edema and albuminuria.

5 Variations in blood calcium level were small in this series but the dose of dihydrotachysterol used was never more than 5 cubic centimeters per day.

6 This dosage is considerably below the level of replacement therapy in hypoparathyroidism and produced no toxic effects.

7 The use of dihydrotachysterol would appear to be a more physiologic and hence safer method of increasing calcium utilization to emic women than the administration of parathormone.

8 No explanation of the mode of action of this treatment is offered.

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6 L. EZ. R. E. S. g. Gyn. Ob. t. 9 9 49 68
7 M. D. HAL. A. M. d. DR. KE. J. C. Am. J. Ob. t.
934 7 800
8 M. TCHER. J. R. M. d. R. d. N. Y. 9 78 906
9 M. RE. L. d. R. THE. F. J. phy. l. p. th. g.
9 4 9
RE. C. I. J. Am. M. Ass. 934 745
Ri. H. v. G. C. Illin. M. J. 3 59 453
SEUT. E. V. S. g. Gyn. Ob. t. 937 65 480
3 Id. m. Am. J. Ob. t. 94 4 40
4 Id. m. U. I. C. t. R. 944 48 4 3
5 Id. m. J. Ob. t. Gyn. B. t. h. Emp. p
6 THE. LD. G. W. La. t. L. d. 937 3 39

EARLY RISING FOLLOWING MAJOR SURGICAL OPERATIONS

PAUL W SCHAFFER M D a d LESTER R DRAGSTEDT M D Ch c Ill s

EARLY rising of patients after major operative procedures has since the enthusiastic report of its first advocate in 1899 (4) attracted the attention of many surgeons. A recent review by Newburger adequately summarizes their observations. Interestingly enough, those who have given this principle an extensive trial have almost uniformly been favorably impressed and many have loudly acclaimed its virtues. In general, critics of the practice have self-admittedly had little experience with it and have based their criticism on one or a few unfortunate complications which may or may not have been justifiably attributed to early rising. In spite of the fact that the medical literature mainly European contains reports of many thousand of favorable cases, only in the past few years has any significant amount of attention been given the subject in this country. This seeming paradox exists because early rising of patients after operation is the exact contradiction of one of the most deeply rooted principles of patient care. Early rising of patients with early and rapidly increasing ambulation together with coughing and breathing routines is not here being advocated as a substitute for but as an adjunct to the generally accepted and proven features of surgical technique and preoperative and postoperative care. Indeed, early rising is now possible only because of improvement in surgical technique with gentle handling of tissues, accurate reconstruction of wound, strict asepsis and antisepsis, adequate general and local preoperative preparation, good anesthesia, prophylactic and definitive decompression of the stomach and intestines, retraction and maintenance of fluid balance and recognition of the importance of blood and plasma loss which must be replaced by adequate transfusion. Undoubtedly, in the past, attention to early rising and ambulation of patients occasionally met with failure because the care of the patient was otherwise inadequate.

It was with considerable hesitation that we began to test the principle on patients who had had some of the larger surgical procedures

Th fir t cas w th t f 68 y old f m l w th
l g m f the h p t u fi x u f th l Aft
deq t p p t hydrat a d bl odr sf th
p t t w pl red thr h l g ht pa medu n u
Th tum m w f nd t b firmly dh n
to th d d um d th h ad f th p b t
ll f th v l bl tum w c t uity d n m t
m tast w ctu w d Th n
tat d M m al f th ght lo ll of th
d od m p t f th t m h ad th h d n d
p t f th body f th p R tru t ted
g l trans r c l t my h l cy t j un t my nd
f st j t my Th bd m losed w th t
d b Th pe t ca d t d t
pun la esthes d l t d g h Blood d al
dm n t d th gh t th prt C tin
W t t f the t ma h w s h gu m
m dnat ly ft p t dws tu df 48 h
Th p t t g l dit m dg db t th
d v f l w g pe t n th p t l fild t the b s
w d ll b th so d w pp ed d al w
p t R p t w f p h t lt f l
th t th p t n w ld l k ly d l p pulm ry
mplu t f th d ry g m f ll ds
th d post pe t d y h em d f m th
b l d ll ed i ta d th fl d t t h
f g m t C b h g d d p b th g w
u ed H gh p d t f al m d m
f wh t f th y m d m nat f th l fild
w l d f l rati th d ppe of th b l r l
R purat n w f gr tly mp d q lty R p dly
the p t t tum aw yf m th bed ea d nd b
nd th d y s took t daly toll p d d w n th
nd H maximum t mpe t l t w ool
d gr s F d w rd d th th d p t pe t
d y By th fifth d y he temp t w m l
may l untl th tum f disch g f m th h p ta
d y ft p t Th s l ng hosp tal st y es l t
m f m th t test f th t f th f m th q
m t f th p t t

Soon after this favorable experience more and more patients were subjected to the same routine. Since enthusiasm mounted within months all patients on the service were out of bed on the second postoperative day. The 102 cases summarized in Table I represent the basis for this report.

As may be seen in Table I the series includes most of the usual general surgical operations. It is made up of patients who without selection presented themselves for surgical care from February to September 1944. Since October 1, 1944 many more patients have been received early rising but a few not included in this communication. The general management of these patients and

From the Department of the Interior, Bureau of Reclamation, Washington, D. C.

TABLE I—SUMMARY OF POSTOPERATIVE OBSERVATIONS ON PATIENTS EXPERIENCING EARLY RISING FROM FEBRUARY TO SEPTEMBER 1944

	N f se	A	D y f	D d sch	T pe		
					M m m l		D d al
					D	L l	
I g a l h r n m					6	99	3
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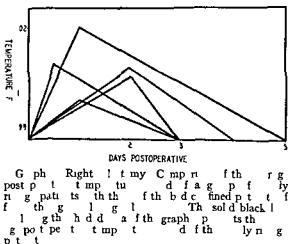
specific surgical techniques were in no way altered with the institution of this program. Abdomens were operated on through a variety of incisions with oblique and transverse approaches being most commonly used. All peritoneal sutures were of a continuous type usually a double strand of either No. 00 or No. 0 chromic gut being used. Closure of the fascia was usually made with continuous suture of either No. 00 or No. 0 chromic gut reinforced with interrupted sutures of No. 0 chromic gut placed 2 to 3 centimeters apart. Interrupted No. 000 plain gut sutures were used for the subcutaneous fat and cutaneous black silk for the skin. A gridiron incision was routinely used for appendectomy. Hernia repair followed the general pattern just indicated. No abdominal prosthesis was routinely used although in cases which were likely to require frequent

dressings an adhesive type corset was employed. Early rising was begun at some time during the first or second postoperative day and rapidly increased thereafter.

It is difficult to convey the extremely favorable impression which has been made on the radical departure from a firmly entrenched routine of postoperative care. This difficulty lies chiefly in the fact that the benefits which result are of a nature which do not easily lend themselves to conversion into letters, numbers or symbols which may be charted or made into graphs. The danger of description is an adequate substitute for the personal observation of these patients. They possess a excellent morale which improves day by day as they are freed from the burden of apprehension and fear and imagined complications which beset a person no

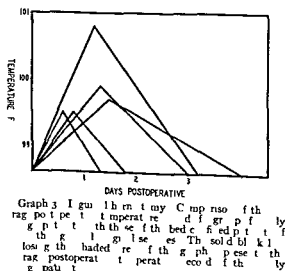
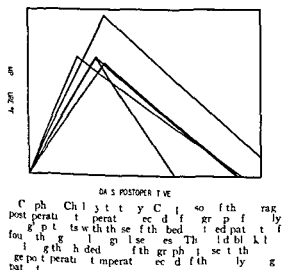
familiar with the ways of medical practice. Because of early exercise the marked weakness felt by the patient who leaves his bed on the tenth or twelfth postoperative day is greatly minimized. Early rising allows the patient to take over the management of his own personal hygiene at an early period and thus greatly reduces his nursing requirements. In this series patients have not been discharged from the hospital as early as their condition would have permitted since an opportunity to observe them closely was desired. However their hospital stay can be materially shortened as a result of early rising. This represents a financial saving to the patient and because of the more rapid turnover allows hospital care for a larger number of patients with existing hospital facilities.

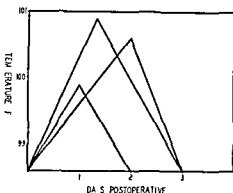
Probably the most important result of early rising is the prevention of many minor and major pathological pulmonary changes. Following operations within the abdomen especially procedures in the upper abdomen and as a result of maintenance of the horizontal position the diaphragm is reflexly inhibited and assumes an abnormally high position. This factor results in basal pulmonary atelectasis with all of its hazardous potentialities. Clinically this condition is evidenced by shallow rapid respirations, increased pulse rate, basal suppression of breath sounds, dullness and rales. These changes have been observed so constantly in the first few postoperative days that they have become accepted as the normal postoperative course and all surgeons are familiar with the postoperative hump in the TPR curve. Leithauser has



shown that with early rising the vital capacity returns to normal in half the time required by the bed confined postoperative patient (1).

In this study the problem was approached by a comparison of the postoperative temperature records of early rising patients with those of bed confined patients. Forty early rising patients' records were compared with those of one hundred bed confined patients cared for by the four other general surgical services of the clinics. The results may be seen in the accompanying graphs (Figs 1 through 5). In practically every instance the early rising patients had a lower maximum temperature elevation and resumed a normal temperature level sooner than did the bed confined patients. Clinically this freedom from prolonged fever was closely correlated with improve



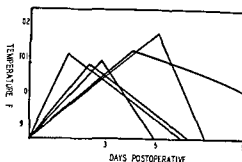


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ment in the character of respiration. Others have claimed for this routine a lessened incidence of thrombophlebitis, phlebothrombosis and embolism (2) but since these complications are relatively rare in this area, no valid information can be obtained from this series in which none of these complications was observed. It may be that early respiration would be an adjunct to or possibly a substitute for vein ligation which is practiced in the Atlantic and Gulf seaboard states in which localities these complications are common.

Almost the only consistent criticism of early respiration is that it might mechanically damage the wound and result in delayed healing, postoperative herniation or dehiscence. From observations made on these 3 patients there is no basis for such criticism. In the entire series only four significant complications have been encountered. Two were fatal and two were late herniations, and in no case is there good evidence that the same complications would not have occurred fearfully rising doubt been ironed out. No significant pulmonary complication occurred in any one of the 103 cases.

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SUMMARY

In summary the early rising of 03 general surgical patients has been observed and has resulted in a uniformly favorable impression of the practice. Improvement in the general well being of these patients over that of bed confined patients has been discussed. With early rising there is improved morale avoidance of asthenia more patient self care and less nursing care less financial loss to the patient because of shorter hospitalization and earlier rehabilitation and because of

more rapid turnover more patients can be cared for with existing hospital facilities and personnel. Early rising patients have been shown to have a lower postoperative fever of shorter duration than the bed confined patients of four other general surgical services. This factor in our opinion is closely related to observed improvement in respiration. The record of complications presented here compares favorably with the number of complications observed in a similar group of bed confined patients.

REFERENCES

CHU	CHIL	E	D	d	M	N	il	D	S	g	Gyn	Obst
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EDITORIALS

SURGERY Gynecology and Obstetrics

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JULY 1945

1905-1945

THIS issue marks the beginning of the forty first year of SURGERY GYNECOLOGY AND OBSTETRICS founded in 1905 by Franklin H. Martin. It was his conviction that there was a real need for a surgical journal which should appeal to practical surgeons to be edited by active surgeons the profits from which should be utilized in strengthening its worth and influence.

He was aided by a small group of young surgeons who had been intimately associated with him in the course of their surgical training by Mr. T. E. Donnelley of R. R. Donnelley & Sons Company, a friend of long standing and a nucleus of men and women who have loyally and conscientiously carried out the many sided tasks of great magnitude which are so vital to the success of such a publishing venture. The unfailing interest and enthusiasm of this original group who believed in Dr. Martin's dream and their steadfast devotion to the ideal of creating a surgical journal second to none which was firm within

the heart of each of them are responsible for the success of SURGERY GYNECOLOGY AND OBSTETRICS. The direction of its business affairs, the assembling and composition of the material presented, the quality of its typography and reproductions, the conduct of the daily affairs of this journal have all represented throughout these years the contributions of the personalities chosen to carry out these many activities. It has been their gifts throughout the years which have made of this journal more than an ordinary commercial enterprise.

The editorial policy from the first was created and carried out by Allen B. Kanavel whose idea it was that the journal should constitute a forum wherein the ideas and accomplishments of men in the surgical world could be presented without any imposition whatever of the belief or opinions of the editors. The journal vouched for the honesty and sincerity of the authors whose work it published but left for its readers and time to establish the correctness of their views. All editorial comment and book review have always been published over the signature of the author upon the basic principle that the reader has a right to know the source and may assume that what he reads is a well considered statement of opinion.

With Mrs. Martin's death the direction of SURGERY GYNECOLOGY AND OBSTETRICS passed into the hands of the Board of Regents of the American College of Surgeons, another of her husband's contributions to the surgical progress of this country. The journal will continue to attempt the fulfillment of Dr. Martin's conception of a surgical journal and will devote its pages to the contributions of prac-

tical surgeons edited by active surgeons with any and all profits derived from its circulation and advertising matter utilized for the creation of an increasingly better production

LOYAL DAVIS

SUBDURAL HEMATOMA

SUBDURAL hematoma was once considered a rare condition and of only pathologic interest. Actually it is one of the important indications for surgical intervention after craniocerebral trauma. Virchow originated the concept that subdural hemorrhage was secondary to some inflammatory process of the dura and gave it the name *pachymeningitis interna chronica*. Numerous reports have presented various etiologic causes notably lues alcoholica, curvy and infectious diseases. It was not until Trotter's report in 1914 that the condition became of interest to surgeons.

Contrary to the concept that inflammation is the primary etiologic factor is the concept that the primary lesion is a hemorrhage. The hemorrhage is not necessarily traumatic. Russel and Cairns reported four cases of carcinomatosis and sarcomatosis of the dura with formation of a subdural false membrane. Neoplasm or vascular malformation may be a predisposing factor. The writer has had a case of subdural hematoma overlying a glioblastoma of the temporal lobe and another overlying a venous angioma in the same location. Both of these patients had suffered a mild head injury before the onset of any symptoms referable to an intracranial lesion.

An essential question is the primary location of the bleeding—whether subdural or intradural. Baker, Hannah, Kaump and Love have presented histologic evidence to indicate the intradural origin of these hemorrhages. On the other hand Leary pointed out that in the early stages of encapsulation of

free blood in the subdural space the neomembrane or capsule forms first on the dural side and later on the arachnoid side and that the neomembrane on the dural side is always in a more advanced stage of development than on the arachnoid side. Surgical observations on subdural hematomas in various stages of development substantiate Leary's statements.

The mechanism of the progressive enlargement of the clot is a matter of considerable dispute. All are agreed that there is progression in the development of the clot. Massive acute subdural hemorrhage does occur in extensive injury (laceration) of the brain. These cases have early and marked symptoms and usually result fatally. The onset of the subacute or chronic case is slower and often insidious. The initial brain injury is relatively insignificant or if more severe the patient recovers from it.

Gardner, Leary, Munro and others have assumed that the initial lesion is the escape of blood into the subdural space. As the result of a fall or a blow to the head the brain is displaced in the cranial cavity. This may cause tearing of a vein crossing the subdural space. Recently this has been demonstrated experimentally in the monkey by Craig, Sheldon and Pudenz who have been able to take motion pictures through a lucite calvarium of such a hemorrhage following a subconcussive blow to the animal's head. Usually it is a superior cerebral vein that is torn but inferior veins to the sphenoparietal or transverse sinuses may be torn. In any case rupture of a vein as it crosses the subdural space allows the escape of blood into that space. The venous pressure in the cerebral veins is low and the bleeding usually soon stops spontaneously. A liquefaction of the blood in the subdural space begins the resultant fluid is high in protein content. Since it is separated from the subarachnoid space by only the arachnoid (and

later the newly developing neomembrane on the arachnoid side) and since this is impervious to the large protein molecules in the liquefying blood an osmotic imbalance must exist between the cerebrospinal fluid and the liquefying blood with resultant passage of fluid into the subdural space. As time goes on and the hemoglobin molecules begin to break down there is a great secondary increase in molecular concentration following the breaking down of the large protein molecules. Consequently there is a late secondary tendency to increase in size of the clot. The dura reacts early to the presence of the blood in the subdural space and a neomembrane or capsule forms first on the dural side. Later a more gradual reaction of the arachnoid produces a neomembrane on the arachnoid side of the clot.

Most subdural hematomas are on the lateral aspect of the hemisphere. Some are inferior and anterior others posterior and inferior. They are progressive expanding lesions and must be treated surgically. A burr hole in the parietal region above the ear will disclose practically every clot. Most of them can be satisfactorily evacuated through single or occasionally multiple burr holes. Only rarely is it necessary to reflect an osteoplastic flap. Since the clots are often (12 to 15%) bilateral a burr hole should be made on each side in every case.

In 75 consecutive patients who were operated on a history of trauma was present in all but three. At times the trauma is so slight that it is overlooked by the patient particularly if a considerable time interval intervenes between the trauma and the appearance of the symptoms. This interval may be brief or it may range up to several months. Time intervals of a year or more raise the question of a second later but forgotten injury.

Mental disturbance is the most outstanding clinical symptom and was noted in over 90 per cent of the cases. The picture is usually one of progressive confusion finally advancing to stupor or coma. Very often the condition fluctuates markedly. One day the patient is grossly confused or stuporous the next relatively alert. Occasional dramatic recoveries from apparently terminal coma may be stimulated by administration of a hypertonic solution of glucose or sucrose intravenously or by spinal drainage. Unfortunately if the true condition is not recognized the physician lulled into security but soon the patient lapses into a stupor that is permanent and ends fatally.

Neurologic abnormalities in the form of hemiparesis or paralysis abnormal reflexes or some degree of aphasia are very frequent. These findings often do not appear until late in the development of the condition. Headache dizziness or nausea and vomiting are common.

The spinal fluid is xanthochromic in two thirds of the cases. Clear spinal fluid does not rule out the presence of a hematoma or even make it improbable but xanthochromic fluid usually indicates the diagnosis. However subarachnoid hemorrhage is often present in brain injury and if the antecedent trauma precedes the spinal puncture by less than two weeks the xanthochromia has to be disregarded. Observation of the spinal fluid findings in a large number of cases of traumatic subarachnoid hemorrhage has convinced us that the spinal fluid will be clear within 12 to 14 days after a brain injury.

Papilledema is found in one half of the cases. Convulsions often Jacksonian some time generalized are seen nearly as often as in tumors near the central sulcus. Occasional bradycardia with a pulse rate below 60 is present in many cases. It is seldom persistent.

only recurrent and often is noted only by reviewing the hospital chart over a period of several days

Subdural hematoma during the past thirty years has come to be recognized as an important post traumatic surgical complication. Many cases are still unrecognized. The surgical profession should be more aware of this condition and realize that often it can be

recognized only by the exploratory burr hole. In any suspected case bilateral posterior parietal burr holes should be made. If no clot is found little harm will be done by this procedure which entails minimal operative shock and can easily be done under local anesthesia supplemented by intravenous anesthesia if the necessity arises for such a procedure.

HAROLD C. VORIS

REVIEWS OF NEW BOOKS

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The book is 338 pages in length and is well indexed and bound so that the reader can easily and quickly refer to any portion of the subject. The material is presented in three parts.

The first part deals with the anatomy of the feedback product system and the physiology of the agents used to control pain. The second part describes some rhythmic mechanisms on the psychology of the management of pregnancy and labor.

Part II reviews the history of the relief of
 the children from the ancient civilizations to the
 present. The techniques of adoption
 of the various pain killing agents are considered.
 Caudal anesthesia is treated in great detail and the
 authors leave no doubt in the mind of the reader
 that this is the preferred method. They do not give a
 balanced analysis of the discussion of the contraindications
 to a caudal anesthetic.

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complete and undistorted to encourage its publication.
1944. The index is adequate even for the
material included. AMERO E H S o c

Excellent laboratory medicine is presented by Hamblen in his *Field Cology of Illness*. It is sometimes the province of gynecologists and endocrinologists to be specialists that a employed rare r biza e c diti ns or n strictly gical rders. This certainly not th

The problems of food and growth in adolescence are the usual common and fundamental problems of health and disease and such concern the average physician. In other words, the material is both suitable and will be useful to the general practitioner.

[illegible]

The book can be usefully commended
M P S AR

In the preface to the first edition of the book
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This book does not contain any of the underlying principles, physical effects or technique of measurement. The material consists entirely of the indications for the use of mass spectrometers used in various general and medical conditions.

The following pathology and symptoms of children are given:
 1. Medical or surgical treatment of the disease.
 2. Other forms of physical therapy, electrical therapy, and hydrotherapy.
 3. The results of the treatment of the disease.
 4. The results of the treatment of the disease.

Th b k n be ecomm nded to phys c l
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F A C I n c W R F C H m b l B S M D
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 W k C o B N o s t M T i b h e d I t m o T b W i a m A

THE fourth edition of *The Pathology of the Liver* by Professor William Boyd follows the same plan as the first edition which appeared in 1931-1935.

The subject matter is taken according to the general dogma systems in medicine and the book differs from others in that symptoms and physical findings are related to the pathological changes. Thus it is neither a textbook of pathology nor a textbook of clinical medicine, rather it is a combination of the two. It is the best of pathology as a general course and also for the student and pathologist.

The material in the book is well arranged and the illustrations are of high quality. The book is written in a clear and concise style and is well illustrated. The book is a valuable addition to the library of the student and the pathologist.

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THE introductory Survey by General Kirk of the development of the book is a thorough and comprehensive survey of the field of surgery, gynecology, and obstetrics. The book is written in a clear and concise style and is well illustrated.

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f h ch s a duty for th s who mu t watch over the health a d th life of th rs

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W T E R C A R R L

AMERICAN COLLEGE OF SURGEONS

THE BASIC MEDICAL SCIENCES IN GRADUATE TRAINING IN SURGERY

GEORGE H MILLER M D Ch g Ill

PROGRESSIVELY increasing attention was being given to the subject of the basic medical sciences in graduate training in surgery prior to the outbreak of war. Since that time the pressure of war's demands on all facilities for medical education and the disruption of graduate training programs have temporarily forced it into the background. Now with the approaching prospect of peace it is again assuming a position of prominence. Its importance becomes even greater due to the difficulty of providing sufficient additional graduate training facilities to meet the needs of medical officers some of whom are even now beginning to be released from military service.

The size of the postwar need has been dealt with in published analyses of the answers to questionnaires sent to medical offices in the military force by The Committee on Postwar Medical Service (2).

Reports have also been made dealing with the possibilities of increasing the facilities for graduate training (3). The need can be met only in part by increases in the number of residents in hospital now qualified for graduate training. It will require in addition the development of training programs in a considerable number of hospitals which in the past have not been doing graduate training. Assistance in this expansion is to be expected through utilization of some of the large private hospitals selected city and county hospitals and certain hospitals of the United States Government services. Cooperative programs are also being developed in which part of the work obtained in the graduate training department of a medical school is utilized in a hospital not under medical school control.

In order to establish the importance of the basic sciences in the training of the graduate surgeon, the program of the American College of Surgeons, the foremost of the organizations which are concerned with the assurance of adequate training in the basic medical sciences. The phases of training have been increasing emphasis in recent years both by the

American College of Surgeons and by the Specialty Boards. The advances in medicine and surgery have made this emphasis imperative. It is therefore that the officers of a hospital contemplating the establishment of residents want to know what constitute adequate basic science training.

It is also important for the training specialty to have this information available. There will be even more trouble after the war when there will be a large number of interrupted programs to be completed. Although hospital generally require now to complete the training of their internes, these are the ones who are now in military service. The longer the war lasts the more impossible this becomes. It is certain that there will be many a young doctor who will find it necessary to complete his training program at some place other than the hospital in which he was a resident when the war brought an interruption of his training.

At the present time one hears complaints that it is difficult for the education of a hospital to find any printed statement sufficiently clear and detailed to serve as a guide for formulating plans for basic science training. The measure holds true for a time when it is necessary to be sure of the adequacy of a program when he is making choice of a hospital resident.

It has seemed desirable to undertake a discussion of this phase of training in order to try to arrive at a clearer understanding of the situation and an adequate program in the field of basic sciences. It is not the purpose of this discussion to arrive at a proposal or even to outline a curriculum of the basic sciences which is needed. Such detailed outlines must be very considerably to the following: (1) definition of needs for the different periods of the life cycle in total length of residency (varying from 3 to 8 years); (2) definitions in terms of student being utilized for training.

It shall be the purpose of this study to emphasize the broad perspective of the major subject and to consider some of the means for attaining them.

PRELIMINARY SURVEYS

It is a matter of common knowledge that there is considerable variation in the programs of graduate training in surgery in different institutions which are doing excellent work in this field.

In order to make an effective approach to a consideration of the place of the basic sciences in the programs it seemed desirable to visit a number of representative institutions. These visits were used to some extent for the obtaining of statistical data regarding differences in the programs but still more through interviews with members of the staff who are responsible for different phases of the training they were used to gain an idea of the developmental background behind the differences. The interviews also offered opportunity for a frank discussion of the experiences in each institution as to points of special strength or weakness and the present trend of their efforts to improve the program.

The visits while concerned chiefly with the larger medical schools have not been confined entirely to the subject but have sampled as well the experiences of certain smaller school and non-teaching hospitals which have been offering approved residencies. They have also been made to include a limited number of hospitals which have not been doing graduate training but are now preparing to begin it. The latter have been included in order to gain a firsthand knowledge of the special problems faced by such hospitals in undertaking this work.

Geographically the contacts have covered the country widely in order to include any significant regional variations and trends.

The following discussion has grown out of interviews with members of the staff of thirty-four medical schools and of twenty-five non-teaching hospitals.

HISTORICAL

It is worthwhile to note briefly the sequence of developments leading up to the present position of the basic sciences in graduate training in surgery.

The training of specialists in the field of surgery has shown a steadily increasing emphasis on the basic sciences over a considerable period of years. Fifty years ago the young doctor serving as an apprentice or holding an assistantship in a department of surgery was concerned chiefly with developing the best possible skill in operating. Often exaggerated prominence was given to such considerations as speed in operating and the ability to operate through extremely small incisions. Considerable attention was given to the special suture methods and to various techniques of tying ligatures.

During this period the more energetic and progressive men holding assistantships in the better university departments of surgery were likely to seek opportunity to serve in the department of anatomy as demonstrators to the undergraduate medical classes. Some became excellent teachers of anatomy and were a source of stimulation to students by introducing examples of the practical application of the study to their clinical work. This work in anatomy has been retained by many institutions as a part of the graduate training program though not most trainees assist in the course in surgical anatomy instead of in general anatomy. The point to be emphasized is that at that time work in anatomy constituted usually the only specific emphasis on basic science during the training of the surgeon.

About the turn of the century there developed an emphasis on the value of a study of pathology by the surgeon in training. This was the result of the wider appreciation by surgeons of the fact that successful surgery is dependent not only on a knowledge of the anatomical accessibility of the lesion and on good technique but also on a full knowledge of the life history of the disease process. Whether in the realm of inflammation or of neoplasm or of other surgical conditions the surgeon wanted to think beyond the immediate anatomical lesion and understand fully its near and remote effects and sequelae.

For a time in the field of training pathology was regarded more or less as an interloper and a competitor of anatomy. One heard at times heated discussions as to which of the two should be chosen by the prospective surgeon as his field of basic science work. After a relatively few years these arguments practically disappeared. The ambitious trainees were adding pathology and retaining anatomy by giving a reduced amount of time to the dissecting room.

Some professors of anatomy resisted at first the reduction of the demonstrator's time but before long both pathology and anatomy were sharing in the basic science attention in most good programs of surgical training. A limited attention to bacteriology was sometimes included with pathology.

More recently with the extended use of surgery in the reconstructive field where physiological considerations are prominent and with the development of corrective surgery in certain abnormal physiological states physiology and biochemistry have been brought prominently into the training picture. Also new developments in the field of anesthesia requiring discriminating choice and foreknowledge of potential complications have improved handling of shock and of preoperative an-

postoperative management together with all the new advances in the control of infection have brought physiology, biochemistry, bacteriology, and pharmacology all into a position of increased interest for the surgeon. One might even add parasitology to the list out of deference to those surgeons who are dealing constantly with such conditions as hydatid cysts, amebic abscesses and elephantiasis. Thus it is evident that surgery has gone steadily into a closer relationship with practically the whole field of the basic medical sciences.

THE OBJECTIVES

In seeking an answer for the question of the hospital committee or of the trainee referred to above it is necessary to visualize as clearly as possible the objectives toward which the basic science work of a graduate training program in surgery is directed. These objectives may be variously expressed and must be permitted a certain variation of emphasis in different institutions and under varying conditions.

However the broad general objective of graduate training in these specialties is to provide for the country the highest level of surgical care by furnishing, under competent instruction and supervision, the best possible training in both surgical skill and surgical judgment.

Another objective is the development in the future specialist of a scientific interest and background which will make him capable of doing such opportunistic as may be present in his work for contributing to the advancement of medical science.

The emphasis on the basic medical sciences in the training program while directed toward the broad objective referred to bears most heavily on that which is regarded by many as the more important and more difficult phase of training—the development of surgical judgment. For this it must be applied basic science. It is applied in many ways but especially in the scientific study of pathologic conditions, the equilibrium of a clear understanding of the fundamental interpretations of clinical phenomena in the special field. Developed in this way the basic sciences are measured from the status of the new work and should be of real graduate caliber. They also take on new importance by revealing a threefold goal—thorough training, improved care of patients and contribution to science.

Some unfortunate misconceptions have arisen from failure to understand the applied basic science as advanced work at graduate study level. Following are the misconceptions most commonly met.

1. Review courses are needed because the resident has forgotten details of his undergraduate course.

The basic science requirements of the College and of the Specialty Boards are academic hurdles which require special basic science study to clear but are of no further concern.

3. Lectures by a preclinical teacher can confer real benefit on the clinical staff to make adequate application of basic sciences.

4. Basic science requirement can be met by giving the resident training in the technique of the diagnostic laboratory of the hospital.

Let us consider in turn each of these misconceptions.

1. *Need for review courses.* Certainly the resident will have forgotten details of his undergraduate work and review study is necessary. This however is not done best by formal review courses. He should be obliged to review in order to meet the demand of the advanced work of his training program. Such demands may consist in assigned participation in well organized symposiums, programs and clinical conferences at which he is present also in ward rounds and in clinics if these are kept to a high instructional level. The latter is illustrated by the answer of a resident he asked about attention to aatomy. He said: "We don't have any review course but the Chief gives a real quiz on anatomy as a part of his duty and queuing at each operation a few seconds have to review all the time to keep up with him."

In general one may say that the demand for review should be inherent in the well organized graduate training program but for formal review courses of undergraduate work would not constitute a part of the scheduled learning.

2. *Treat basic sciences as if dead.* The desire that the basic sciences are held is not entirely correct. Certainly as requirements for qualification in the specialty, they assume the scientific character. The error lies in treating them as something more than hurdles. He in reality meets the equilibrium of the scientific work of development. The error is attested by the tendency of some candidates for qualification to go to the head of a preclinical department saying: "I mean to take the time to learn this stuff in. I want you to get me ready for doing these with the books. I of course will usually try to give something to do before the request though I express doubt of the permanent value in many cases. Such a period of study is an opportunity of real value. The error occurs when the candidate treats it as mere mulling of an examination."

Likewise some hospital committees seem to have regarded the basic sciences as merely awkward requirements which must be met.

This regarding of the basic sciences as mere hurdles and the reliance on cramming for examinations should steadily diminish as more and more emphasis is placed on the application of these sciences to the daily work of the clinical specialist.

3 Use of undergraduate lectures The suggestion is sometime made by the educational committee of a hospital that they will meet the basic science requirements for residents by having them attend the undergraduate lecture courses in a nearby medical school or sometimes by arranging for professors to give special short courses in those preclinical subjects. To say that this is unsatisfactory is no reflection on either the professor or on his undergraduate course.

The difficulty is that such undergraduate lectures are not applied basic science nor are they graduate work.

If a hospital is to use university courses to supplement its training program in the applied basic sciences such courses should be given by teachers prepared for this graduate work and having a knowledge of the clinical problems sufficient to permit them really to present the application of the basic sciences.

4 Training in diagnostic laboratory The question of filling the basic science requirements by assigning the resident for a period of training in the diagnostic laboratory can be answered by recalling the main objectives of the resident's training program. It is not reasonable to use his time for training as a laboratory technician. His knowledge of the more elaborate procedures of the laboratory should be such as to emphasize the range of usefulness and also the limitations in his field. It should thus enable him to make more effective use of laboratory work in his clinical decisions.

Exceptions will of course arise as in the case of a resident who is engaging in a research problem dependent on certain clinical laboratory tests. He will need thorough understanding of those procedures and can usefully work in the clinical laboratory as an integral part of this special program.

The principle governing the relationship of a resident to the diagnostic laboratory should be a recognition of the fact that he is there primarily for training in applying laboratory findings to patients and only secondarily or in a research capacity to take part in the technical work of the laboratory.

DIFFERENCES IN APPROVED TRAINING PROGRAMS

Differences in total length of training period The length of time which has been adopted by the Department of Graduate Training of the American College of Surgeons and that required by most of the Specialty Boards for surgery and the surgical specialties as the minimum for the institutional phase of training is three years after an approved internship. In the larger teaching hospital the length of residency varies all the way from three to eight years. Approximately half of those included in this study were found to have surgical training programs of five or more years duration while the other half have programs lasting either three or four years.

At times in the past there has been some difference of opinion as to the relative merit of the shorter graduate training programs. It should not be regarded as reopening any old controversy to take the position at the present time that the new residencies to be developed in the effort to meet the postwar training load will fall for the most part in the second group and will be of three or four years duration. For this reason the following comments should be regarded as referring especially to the facilities for and possibilities of this group.

This is not overlooking the value and the necessity of training beyond the three or four year period. The ultimate aim should be accomplished effectively with a wider recognition that the years immediately following completion of a three or four year program are a continuation of training while holding a limited responsibility appointment.

Variation in content of the training programs The institutions studied showed variation not only in length of training program but also in content. Over many years the accomplishment shows however that this considerable variation.

If program is not inconsistent with excellent results. In reality such flexibility is desirable as permitting the best utilization of the differing facilities of institutions both in material and in staff. A certain flexibility should also be utilized in developing most effectively the special scientific aptitudes and interests of the trainee. It should be remembered however that the range of variation which may be appropriate in programs of six to eight years duration is much reduced when one deals with a three or four year program.

Time devoted to the basic sciences Confusion has sometimes occurred because of two different interpretations of this. Some have discussed it as referring only to those parts of a residency during

receiving a parite time allotment must not be regarded as la king in importance

The most common special assignments of time for the basic sciences are to pathology and anatomy

Pathology Since many of the surgeons decision depend closely on his personal knowledge of pathology this subject becomes the one most urgently requiring an individual assignment of the resident's time There is practically unanimous agreement on this The hospitals with long training programs in many cases allot a whole year to pathology while those with shorter residencies commonly reserve six months primarily for this work

In addition to this period of concentrated attention to pathology it is of course essential that the resident throughout his whole training should continue to study the pathological material from his service In a surgical service which has its own department of surgical pathology this is easy In others the necessary daily or frequent contacts with the department of pathology must be maintained A few surgeons have voiced the belief that the latter type of study of pathology can be made sufficiently thorough alone to serve for the resident's training in this subject Most however think that this type of divided responsibility can not produce as good a result as when combined with a period of full time service in the department of pathology Another advantage in the assignment to pathology lies in the opportunity during this time of carrying on or of collaborating in a research problem in this field The experience in exhaustive reading in the field of his research problem and the need for discriminating evaluation of the work of different contributors to its literature are an invaluable element of this part of his training

Anatomy Often a special assignment of time is made also for the study of anatomy This is true in about half of the programs surveyed Two surgeons placed anatomy as more important even than pathology in the study program However this is more than offset by the opinions of many professors of surgery who think the time can be better utilized if careful attention is given to pointing out anatomical considerations added to quizing prior to and during operations and in the autopsy room thus allowing studies on the cadaver to be reduced to a relatively small number of special regional dissections

While a separate allotment of time for work in a department of anatomy is desirable and is possible in the longer training programs it would seem that the necessary emphasis on this subject

can be otherwise provided in a well organized training program In this case however it must be definitely included as a teaching responsibility of the surgical department

Bacteriology physiology and pharmacology Applied bacteriology will usually be included to some extent during the period devoted to pathology In general however all of the above group of subjects are applied so continuously in the daily work of the resident and are such an essential part of the study and treatment of his patients that the clinical work of the hospital becomes the place where the advanced study of these subjects must be centered Every ward round and conference must stress one or several of all of the according to the variety of the cases presented They should also be given special and detailed application in seminars planned for that particular purpose

The use of specialists from preclinical departments and from other clinical departments who are qualified for this teaching is a necessary part of the program but they should be regarded as consulting specialists and contributors and not used as a means of relieving the clinical staff of their continuous responsibility The residents research work also whether clinical or preclinical in origin will require advanced study in one or more of the basic sciences

The important broad consideration here is that the application of these sciences to the study of disease in patients should be real graduate work for which the clinical departments must carry a large share of responsibility

Use of teaching assignments in preclinical departments In the longer residencies an assignment to assist in a preclinical department can sometimes be used to advantage since the liberal time available allows the resident to engage in research and advanced study as well as to assist in teaching In the shorter residencies the brief time available for such an assignment is likely to be entirely occupied by a heavy routine teaching program This creates a danger that the resident may become only a borrowed teaching assistant instead of a member of the graduate training group of that department Preclinical teaching assignments should be used only when the training value for the resident obviously compensates for the time allotted to the department

Research The value of research as a means of stimulating study in the applied basic sciences should be utilized in the graduate training program Only the longer programs can allot a large segment of time for example to the bacteriology laboratory for a study of infections or to some

other laboratory for experimental work in that field. Nevertheless it is possible and necessary even in the shorter programs to stimulate an inquiring attitude of mind and to encourage and guide the resident in investigative work on some problem of particular interest to him.

Co-operative programs. Some hospitals recognizing their eagerness for training in the basic sciences have corrected the defect by appointing to the staff men specially qualified for this work.

Other hospitals which face a similar difficulty but are unable to apply the same solution should seek to develop a co-operative program with the hospital of a convenient medical school or with a graduate school of medicine which gives a fully approved graduate training program. The following illustrate different forms of co-operative effort already being used.

1. A co-operative program is arranged with the hospital of a medical school under which part of the residence is spent in each of the two hospitals. Three-year programs divided on both 2:1 and 1:1 ratios are being employed. Two years in each hospital is a proposed improvement.

2. When a medical school is near at hand a program may be planned by which the residents can have access to certain of the applied basic science facilities provided for the surgical residents of the university hospital.

3. Arrangement may be made for the resident to spend one year in the combined applied basic science and clinical program of a graduate school of medicine which offers a fully approved graduate training program.

4. Arrangement may be made for selected members of the staff to become temporarily ad-

juncts to the teaching staff of a university hospital to gain a broad scientific background and a better familiarity with graduate training methods.

5. A hospital may secure the assistance of guest teachers. This refers not to the usual series of visiting lecturers but as one hospital plan employs it a ten-day full-time visit during which the guest takes part in ward rounds, discussions with the staff as well as in the conferences and seminars for residents. Additional forms of co-operative effort will doubtlessly be devised as medical schools and hospitals continue to work a plan to effect for the best utilization of their combined resources for graduate training.

The foregoing discussion has dealt with the basic science requirements in a broad way and in the light of the immediate postwar training needs. It has not dealt with strictly one-department questions such as the need of ophthalmology for special courses in physics of optics and physiology of optics nor of otolaryngology for similar need with reference to sound. Likewise the big question of need for a greater responsibility on the part of medical schools for graduate education in the clinical field has been omitted.

It is hoped that the discussion may be of assistance to certain hospital staff groups who desire to undertake graduate training to evaluate their resources and to take the necessary steps to organize a strong training program.

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July, 1945

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*Supplementary to
Surgery, Gynecology and Obstetrics*

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CranioPlasty JACK I WOOLF M D and A EARL WALKER M D F A C S Chicago Illinois 1

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

H d
M IELD F H d LE CH L A R p f
C n i D fe t w th T tal m
ECH LS H d COLCLO CH J A C n pl ty
th T tal m Pl t

Eye
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thalm N t rum

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M bl St ppl A Nev Ad th S g l
Tre tm t f Chm l Ot scl E l d
R lt f R h St dy f ooo C
Wh h F est t Ha B P f rmed d g
th L t S l rs

No e and Sin s
McMAHO B J Th T tm t f S tus
Child
D SUR B R D b t G g I l g th
S ses
D u g J R Ot m f th r t l S R
pot f 5 Cases

Pharynx
I LM N DUE S HNE D R W H D
ROGUA F T d SLO N R l P cll
Th rapy H m lyt St ptococ l h r yng t
d T l t
AR KL M F STUTSM N A C d Moo S
Th T tm t f l pe bl Ca f th
Th t A f l w Up f P R po t

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SURGERY OF THE NERVOUS SYSTEM

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P n p h e l Nerves

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L rg N rves t th Tum f Amp tat

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Brain nd It Co ring Cra ial Nerv s

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SURGERY OF THE THORAX

Ch t Wall and B t

LEBSCH z K P g t Disease f th N ppl th
Special R fre t Its C rse d Treatm t

6

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St dy B ed 73 C es

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Rese t th T t t f T b l

S P F Lock o I H M H L
Bc m W W d Oth I l
Th py B h t

T v M D d M L N T T t I I
t my f B g B h l Ad m
C R p t

N v W F d S m I W G l d Ob
st t Emphy m I f t

R E J F H T O S d R M
Pl l d P l m n ry S pp t T t d
th P n l l

Heart d P n rd m

/ mo J d Sz c M M E h u oc cu Cyst
f th H t R pot f Cas

E oph gu d M d i t m m

Lo m R M d C t r r C S P m m d
t m th N b r n

L m v M d CL J R d m T t
m t f C f th E ph gu

M c llaneo

v BARR V G Embl m O g u t g th
P l m ry v

B v S S d S m M L Th
M n f tat f S d

CARR LL D S d C P R tg P th
l gy f th Ch t B t l C l u

SURGERY OF THE ABDOMEN

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P t um

G tr nt tun l T t

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D L R P m f W L Scr P W
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t f th v gu N r v th T t m t f
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C t r m E t nt

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f th Sm l l B l w th Sp c l R f t

Ca w th P R tg F d

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d M CARTNE J S f l ted S d H f
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as S G l H p tal

87 K E L J Th S sat f G St ppa
d g th O t f A t Appe d t

M LO H R J R S d DRE C R R l
f Lymph d Hyperpl t Appendi us

3 S ELL R L Appe d c t i d th S l f m d
Drugs

F m HOLM J U l t C l t aft v
y T t m t f Ca f th Ut rus

33 L r G H B l d d P c d Spl

33 B CHIL C A D P H d T E v
G gr d P f t f th G l l Bladd

3 POMERA R G ad H G P LE M f
M E M Sp ta Ch l y tod od sal

3 f t l P t i w th Pr m ry H p t m
f th L

M l l

36 M M d F v S O Spo ta ce
I t Abd m l H m b

GYNECOLOGY

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36 RA D LL C L R m t i d Man m t f
th W m P d p d t Ut m Ad oc

8 J ES C A N AE T d M KE ZIE
L L Th v l f v m l Sm rs th D g

37 C RM V B Z Th P t f C f th
C r v

38 Ada l d P n t r m C d t

79 W B A N v n v f th F m l P l us
M r o v D G P l v Lymph d t my m th

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th
C LE F Th U f C A esthes A R
f oo C se

Surg I I trum ts and Appar ts

S I W Th Effect f T perat th
D gest f C ll g S t es d Su g l G t
(Catgut) by E ymes d by th S bcut
T f th F g

PHYSICO-CHEMICAL METHODS IN SURGERY

R tg n logy

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Spe l R f t It C urs d T tm t

L ma R M d C orr C S l e m m d
astu m th \ born

Z mo J a d S cs M M F hu ococ Cy t
f th H t R pot f C se

B k r S S d S s m M L Th ra c
M fest tu f S dos

V m A Sol tary d M l pl C r f
th Uppe Alim tary Tra t

F m \ Dae J O Stra gul tr g Obstru t f
th Small B w l th Spec l R f t

C es w th Poo R tg l d g

HA d C J V n es f th Esoph gu Ch l
d

C o D S d C P Poe tg P th
l gy f th Ch t B tit C lt

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M ve M Sp ta Ch l y tod od l

F t la P t t th P m y H p t m f
th L

N m W B Th U f \ C tra t M
da m (v o-R y p k) th F m l G

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ry Emb l f l l g Hyst salp g g phy

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Th rapy f M mm ry C ca m S l

St dy Ba d 73 C
E RE H H LM J Ul ti C ltu aft X
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R drum

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JULY 1945

NU R I

CRANIOPLASTY

Collective Review

JACK I WOOLF MD and A EARL WALKER MD FACS Ch ag Ill n

INTRODUCTION

THE interest of the ancient physicians in trepanation suggests that cranioplasty was not an unknown field (5). In the old world a number of writers discussed the repair of cranial injuries. Fallopius (2) states that if the bone is uncontaminated and healthy it may be replaced provided the dura mater is intact if the brain is exposed the loose bone fragments should be discarded and a gold plate inserted. However the procedure seems to have fallen into disrepute for both Franco (4) and Pare (11 p 67) speak disparagingly of the operation. They infer that in many cases cranioplasty was carried out by quacks who pretending to put the precious metal into the cranial defects surreptitiously dropped it into their own pockets. Religious tenets of the time also mitigated against the procedure. In 1670 a skull defect in a Russian was repaired with a piece of bone taken from a dog. However the ecclesiastic nobility decreed that the bone of a dog was not befitting the head of a Christian gentleman so that under threat of excommunication the bone was removed (6 p 7).

In many of the primitive races trephining was practiced by the natives usually to let out the devils that plagued the patient. After the bone was exposed by a T shaped scalp incision the cranium was scraped away until the dura was exposed. To cover the defect a piece of cocoonut shell was inserted and covered by the scalp (13 p 9). Although this procedure had a 50 per cent mortality in some South Sea Islands most of the males had been subjected to it at some time.

The modern era of cranioplasty was introduced by Merrem (7) who in 1810 experimented on

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dogs. In 1821 Philip von Walther (13) carried out the procedure in man. With the advent of antiseptic techniques and more devastating weapons of warfare the conflicts of the last hundred years have given a great impetus to cranioplastic surgery.

INDICATIONS FOR CRANIOPLASTY

As Grant and Norcross (59 p 404) state. There seems to be a happy accord among most of the authors as to the indications for cranioplasty. The more common reasons for closing a cranial defect are pain or tenderness at the margin of the opening, the syndrome of the trephined convulsive states, disfigurements, military reasons, and certain psychogenic manifestations such as anxiety or a feeling of insecurity from fear of injury to the brain beneath the defect. One or more of these indications may be present in any individual case.

Pain—tenderess about the skull defect. Not infrequently the scalp becomes extremely tender about the margin of a cranial defect. This hyperesthesia may be associated with either a protrusion or a depression of the scalp over the cranial hiatus. It is generally assumed that the pain is the result of chronic traction of the scar tissues upon the nerve fibers or endings in the scalp. At times the tenderness is so extreme that any manipulation of the scalp is intolerable. The following case is presented as an example of this complaint.

CASE (G F U N 76989) A fifty year old housewife as admitted to the University of Chicago Clinic by R E Kirsch. She complained of fainting spells for several years. She was a woman whose general physical examination was quit-
mildly affected with mild edema of the lower extremities.
plotted for her in the hospital.



Fg (C se) L ft P t t
h m t bef e pl ty d ght th

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rm l t f th head ft p u

pu dsc w l t d b t d 3 d pt rs O
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sary t ruf th b fl p d t l th lp
Th p t th d f l l At th t
f th k ll d fect m ked b l h t m d
Th p t t c t u ed t mpl f p th l d h
dizz es erv es d h t Sh dvi d
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f th d f t b m q t ly t d th t mb g
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t f th h d Th t mp l m g f th d f t
t d th t h l ta t f l p l t f th
k ll E pt f th l cal ph l f d es d l ft
ppe h m ym q d ts p h phys l nd
l g l f d g m l Al mb p t
eal d p f g mm f b p fl d Aft
m l f s f f d th d t b m ll th ed
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fifth po t p t d y 6 f ou fl d
p ted f m b e th th lp Th t f th h d
ppe ed m l Th l g p t d m
t th u t th t f th pl ty l h p
t t t ap m t m h mp d
Wh h w t m th ft th n pl ty
h f l t ry w ll and h d mpl t (Fg)

nounced in the first few weeks after the occurrence of an opening in the skull later gradually decreasing in severity. They are probably the result of vascular alterations associated with the change of position of the body. Many patients recover completely from these symptoms, but others continue to complain and may even develop more symptoms such as easy fatigability and lack of concentration. While unquestionably this syndrome is partly psychogenic, it usually is cleared up or markedly alleviated by cranioplasty. (394) Termier (228) reported that 37 of 63 cases treated by repair of the defect were markedly improved.

Conclusions. The factor producing a skull defect frequently causes damage to the underlying brain as the result of which epileptic seizures may occur (383). In some instances, such as in the case of a brain tumor, the attacks may antedate the occurrence of the opening in the calvarium. The precise pathogenesis of the convulsive seizure is not clear. In some cases cerebral scarring secondary to laceration or hemorrhage may be a factor in the instances concerned. In some cases, as may play a role in pneumocephalography, may show localized atricular dilatation at the site of the defect which indicates a bony defect. Electroencephalographic studies of the case may indicate an area of abnormal electrical activity. Even in the absence of abnormal pneumocephalographic or electroencephalographic findings, an operative anatomical alleviation of the convulsive state (59). In these cases

Syndromes of the skull. The most common complaints of patients with a defect of the skull are headache and dizziness aggravated by bending or stooping. The latter are particularly pro-



F (C) Left Ph t g aph h
ly d ght th m t lt ft
take fr m th t t bl f th sk ll



th calpd f m ty pr p tu
p f th c l d f t by g ft

associated with localized ventricular dilatation the dura mater is usually matted to the underlying brain so that it is advisable to resect the adherent dura and the scarred brain to the ventricle and then repair the dural defect with pericranium or fascia lata (62 239 382 384). Repeated subdural injections of air have been recently advocated to further decrease the likelihood of corticomeningeal adhesions (369). Following cranioplasty for epileptic states anticonvulsant medication should be administered postoperatively for at least several years. If the attacks do not recur the medication may be decreased gradually and eventually eliminated.

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944 h c o m p l e f e a g h d h t h o c a l
m u d p t p f d t a n t b j e c t d b l d
H w f r r d t t h U r s t y f C h g C l i n i s b y
R S V f R o c k f d l l l S p t m b e 939
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f r a t e d d t h p e g l r g d t t h f l
d l l a r A f t s e b g f i t h b d a l p a c e t h d f r m
g a b r a u s e t e e d i n s e t e d d b s c e s
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s o m b l f o u u n t l l d b y r p t d l m b
P N q r e d m p t t O t b e 9 939 d
N m b 4 939 w t h p t l q t c t m y t h
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(F g s d 3)

Cosmetically Cranioplasty is indicated for cosmetic reasons predominantly if the cranial defect is located in the frontal region. Usually such cases are complicated by unsightly scars. If the frontal sinuses have been involved the disfigurement may be quite severe. The use of alloplastic substances is particularly desirable for the

repair of such large defects because an almost perfect restoration of the contour of the forehead and supraorbital ridges may be accomplished.

Military reasons Because army regulations state that a soldier cannot be returned to active duty if he has a cranial defect larger than 2 cm in diameter cranioplasty is necessary in military practice in order that the patient may be eligible for duty.

Feeling of insecurity Although the actual danger of traumatizing the cerebrum through a cranial defect is very minimal patients frequently complain that they are constantly worried lest they hurt their brains and in some cases such anxiety amounts to an incapacitating psychoneurosis. Cranioplasty may lead to a regression or marked amelioration of the psychogenic disturbances.

Psychogenic disturbances induced by a cranial defect Patients of a psychoneurotic personality will frequently have a marked exacerbation of their psychogenic difficulties if they suffer a head injury which results in a cranial defect. Psychosomatic manifestations may develop. In such individuals cranioplasty may offer relief but the cases should be carefully selected after psychiatric consultation.

CONTRAINDICATIONS

Since cranioplasty implies an attempt to restore an individual to a normal state its performance should be delayed until the primary condition producing the abnormality is no longer active. Otherwise the operation would be of very temporary benefit. In practice there are a number of factors which are relative or absolute contraindications to the procedure.

Infection If there has been considerable active infection cranioplasty should be carried out only when the wound has been completely healed and free of infection for many months. In some cases even when an interval of from six to twelve months has elapsed from the time of healing a cranioplasty has resulted in a reinfection of the tissues because of the able organisms still present in the scar. Small encapsulated abscesses usually have become sterile by this time but the capsule and surrounding scar tissue may still contain viable pathogenic bacteria. In the present world war this period of waiting for infection to clear up has been reduced to a few weeks by the routine use of the sulfonamides and penicillin. Some operators have successfully placed alloplastic grafts in infected wounds trusting that the mother py to take care of the infection. However, such a policy is highly risky and appears to have a

considerable risk of failure due to infection. The consensus of opinion is that the wound should be healed for a few weeks before the cranial defect is repaired even when sulfonamides and penicillin are used.

Abnormalities of the cerebrospinal fluid Alterations in the cellular constituents, protein or pressure of the spinal fluid usually indicate the presence of an active pathological condition in the nervous system which contraindicates cranioplasty. A pleocytosis of the spinal fluid without leucocytosis and an increase in protein is usually an indication that there is still active inflammatory reaction in the nervous system the most likely cause of which is an abscess. Persistent increased spinal fluid pressure suggests the presence of a space occupying lesion or pathological alterations in the circulation of the cerebrospinal fluid. Cranioplasty removing the dural pressure would precipitate marked intracranial hypertension which might elevate the graft and the defect or filling this means relieving the tension give rise to headache vomiting and papilledema. For this reason papilledema is obviously a contraindication to cranioplasty (378). Even if the spinal fluid is normal it seems advisable in all cases of penetrating wounds of the brain to illuminate the possibility of a latent brain abscess by pneumoencephalography (373). These contraindications must be visible at a later time if the patient emerges without the symptom.

Foreign bodies within the brain The presence of metallic particles within the head has been said to be a contraindication to repair of skull defects (385). However, the fact that many such objects may be present in the head for years without producing a focus toward infection tends to negate this view. Bullets and metal missiles per se do not appear to increase the incidence of abscess or epileptic manifestations. On the other hand fragments of bone definitely undermine the chances of infection and brain abscess (373). If these fragments are not readily accessible and cannot be removed at the time of cranioplasty pneumoencephalography would seem to be indicated to rule out the possibility of coexistent abscess.

Severe disability There appears no necessity to repair a small cranial defect in an individual suffering from severe disability such as hemiplegia. The advisability of cranioplasty in less severe neurological disabilities must be determined by consideration of the individual case. Unless the cranial defect is really contributory to the individual's incapacity one of the positive indications for cranioplasty is present there seems no reason to carry out the procedure.

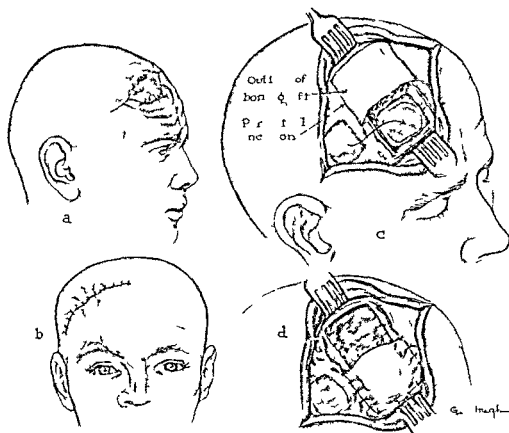


Fig 3 Sk th f h g th b f ()
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t (d)

Epil psy The French ministry of health in the first world war (385) in a circular on cranioplasty stated that epileptic attacks of any kind contraindicated repair of a skull defect. This view is not generally held and as a matter of fact many surgeons believe that epileptic attacks may constitute an indication for cranioplasty. This is founded on the grounds that in some cases convulsive seizures have been decreased or abolished by repair of a skull defect. Unfortunately not much statistical information is available. Craniotomy and Norcross (59) report that the conditions in 18 of 27 cases were improved or the patient was free of attacks after cranioplasty; the latter the cerebral excision benefited 10 of 18 patients.

THE TIME FOR CRANIOPLASTY

Some comment has already been made upon the length of time that should be allowed to elapse

following a head wound before a cranial defect is repaired. In cases in which the wound has been infected it would seem advisable to wait at least a month after complete healing before cranioplasty is done. In the absence of infection the defect may be repaired as soon as the wound has healed. Not a few operators have suggested primary repair of a skull defect with autogenous (15) heterogeneous (256) and alloplastic grafts (369). Unquestionably immediate grafting may be well tolerated in many cases but it seems probable that in a certain percentage of such cases the graft would have to be removed because of the development of infection about retained fragments. Since these cases would require a second operation anyway this may not be a serious objection to the procedure.

In military practice early cranioplasty may permit men who have had penetrating wounds of

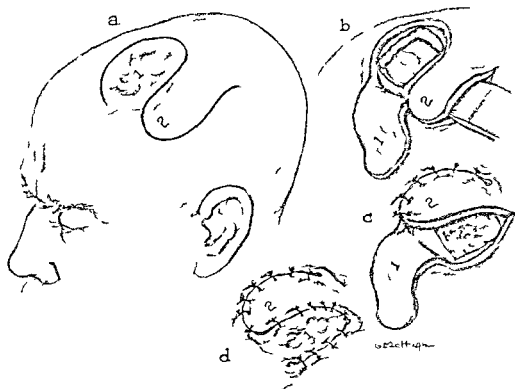


Fig. 4. Illustration of the method of the author for the repair of a large skull defect. (a) The skull defect. (b) The flap of the scalp is moved. (c) The flap is sutured into place. (d) The skull is covered with the flap.

the brain to return to duty within a few weeks of the injury. Convulsive seizures will occur in from 30 to 40 per cent of this group in the majority within six months of the time of injury. It is important to prevent a man on duty from having an epileptic attack since it might not only endanger his life but those of his comrades. Delayed repair of the defect would allow him time to elapse to minimize the likelihood of an attack after the patient returned to duty. For this reason and since so much of present military practice is mechanized it may be well to delay cranial plasticity in all penetrating wounds of the head. Perhaps electroencephalography studies of head injuries may indicate the potential epileptic

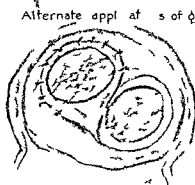
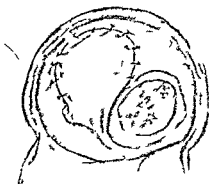
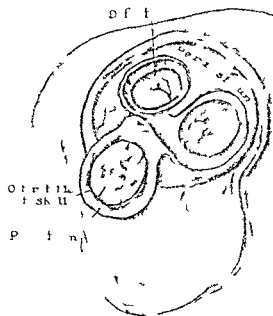
specimens (homogenous grafts) from other species (heterogeneous) or from outside of the animal kingdom (metal or plastic graft). The earliest grafts were bones of the lower animal or they are metals that could be easily hammered into shape. As experience accumulated and surgical technique improved the choice of the graft became more varied.

AUTOGENOUS GRAFTS

The ideal repair of a cranial defect is the regeneration of the bony calvaria. Rarely does it occur in children who have had a portion of the skull removed from osteomyelitis. Although attempts have been made to stimulate osteogenesis in soft tissue over a bony defect (37, 39) satisfactory clinical results have not yet been obtained. Autogenous bone grafting may serve as a substitute for the regeneration of new bone. In the final analysis, however, the success of this

TYPES OF CRANIOPLASTY

The material used for the repair of cranial defects may be derived from the same individual (autogenous graft) from another of the same



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technique depends upon the fate of the transplanted bone. If the graft is absorbed and replaced by fibrous tissue it cannot fulfill its purpose adequately but if it remains viable or is replaced by living bone it is pre-eminently satisfactory for the repair of the cranial defect. Unfortunately in spite of considerable experimentation (10, 19, 25, 26, 28, 30, 41, 70, 195, 259, 737, 380, 386, 387, 388, 391, 396) a complete understanding of the fate of a cranial bone graft has not yet been determined. Only by means of biopsies of human cranial grafts can the question be settled because the findings in animals probably are not applicable to man. From the clinical standpoint however unsatisfactory results in autogenous osseous cranioplasty are not common. As a result of absorption of the graft Grant and Norcross (59) report only 3 unsatisfactory cases among a series of 58 cases. King and Anderson (3) report only 1 case of absorption of the bone graft after cranioplasty in a series of 33 cases.

It was stated early by Ollier (10) that regeneration of bone was dependent upon the periosteum. On the other hand Macewen (86, 390) thought

that the periosteum was only a limiting membrane and that new bone was derived from bone itself. Phemister (397) demonstrated that both views were correct as he concludes: "Osteogenesis in bone repair occurs from the inner layer of the periosteum from endosteum and to a much less extent from bone cells and fibrous contents of the Haversian canals (397 p. 33)." However that which happens to free autogenous bone grafts implanted in the skull of man is not yet agreed upon. Some investigators maintain that the graft is slowly replaced by creeping substitution of living bone from the adjacent calvaria; others firmly state that it becomes calcified slowly and is replaced by fibrous tissue (201). Probably both views are correct; the end result in any case depends upon the age of the patient, the condition of the graft and the surrounding tissues, and the state of sterility of the wound.

11. History of the Muller-Koenig method. On the basis of the experimental studies of Wolff (14) Mueller (95) and Koenig (74) at about the same time in 1890 devised a method of repairing skull defects by transplanting a flap of skin. The

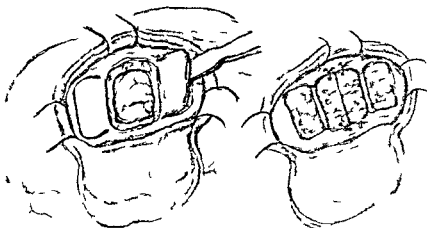


Fig 6 The double flap method for the treatment of the skull defect. The flap is reflected and the defect is covered by the flap. The flap is then sutured to the surrounding tissue.

underlying periosteum and the outer table of the skull. Two adjacent skin flaps hinged at opposite ends were outlined, one enclosing the scalp over the defect and the other enclosing the donor scalp.

The scalp was stripped from the margins and base of the defect; the edges of the bone were freed, and then the two flaps were transposed so that the donor dermatoperiosteal flap covered the cranial defect while the flap formerly over the defect covered the donor area (Fig 4). If the donor area could not be completely covered by this method, it was allowed to granulate or Thiersch grafts were applied. Slight modifications of this technique (81-82, 96) added small refinements without deviating from the basic principle. This rather bloody procedure did not permit as satisfactory cosmetic results as might be desired because of the twisting of the pedicle, so that it was soon modified by turning a single skin flap and using a periosteal-osteal graft.

Periosteal-osteal graft. Apparently first used by Derrant (54), this method of cranioplasty has perhaps been more universally used in one form or another than any other technique (1-5, 16, 78, 80, 143, 44, 45, 47, 48, 49, 50, 52, 53, 55, 56, 57, 58, 59, 61, 63, 64, 67, 68, 71, 73, 76, 77, 78, 79, 80, 83, 84, 89, 92, 93, 94, 97, 98, 99, 100, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000). The

original method consisted of reflecting a skin flap sufficiently large to expose the defect and an adjacent donor area. The periosteum was freed from the margin of the defect; the edges of which were freshened by reflecting. The periosteum was then cut about the proposed graft on all sides but that adjoining the defect. The outer table was elevated by a chisel. The osteoperiosteal graft was then turned over the defect; the attached periosteum being used as a hinge. The periosteum or pleura was placed against the dura mater and the graft held by periosteal sutures (Fig 5).

Several modifications of this technique have been introduced. Periosteal-osteal flaps may be cut on each side of the defect and then turned over to fill it (Fig 6) (29, 88, 90, 100). Instead of hinging the graft (46, 74), some operators preferred to slide the graft into place. Hofmann (66) left the periosteum attached by skin suture enough to permit the bone to be swung into the defect. Others used the bone with or without the periosteum as a free graft (3). Bone chips alone as Macewen (85, 87) and Kennerly (7) suggested have given satisfactory results in the repair of small defects. While many advantages were claimed for these modifications, time has demonstrated that there is little cause to choose between them. If elasticity is required, it is best used in an advantageous hinge where the periosteum attached to the outer table will crack and may fragment if it is not firmly adherent to the pericranium. The lateral tables in molding the flap to the desired

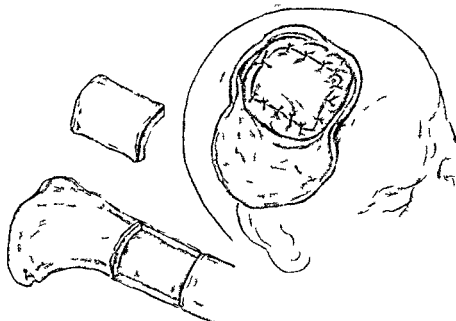


Fig 7 Sk th sh g th t p n t l gr ft f m th t b (l ft) d ft t i t
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shape and may be sutured to the periosteum about the margins of the defect

Tibia grafts Many sources of extracranial bone have been used to repair cranial defects. Which one is chosen seems to depend largely upon the personal experience of the operator. Seydel (156) in 1889 used a tibial osteoperiosteal graft successfully. Naturally dubious of the take of the graft he observed it for five days before he sutured the scalp. Although a tibial graft is applicable only to a relatively small cranial defect unless multiple grafts are used the technique has been quite popular (Fig 7) (65 73 128 132 134 135 136 137 138 139 140 141 142 143 144 145 146 149 151 152 153 154 155 157 158 159 160 161 167 232). If an extensive graft is taken from the tibia particularly if the crest is removed a spontaneous fracture may result in overactive patients. Berndt (131) Axhausen (22) Bufali (133) and Lever (148) suggested leaving a fat pad on the periosteum to place against the dura mater. The necessity of two operative fields is a decided disadvantage as it increases the risks of infection and postoperative complications. Morrison (150) states that the patients all complained of their leg more than their head (150 p 456).

Rib grafts The rib being curved is readily adaptable to the contour of the skull and makes

a satisfactory graft to repair a small defect. Kappis (168) in 1915 used the full thickness of the rib with the attached periosteum and fat to cover a dural and skull defect. A year later Weber (174) reported on its use emphasizing the adaptability of the twelfth rib to cranioplasty. This technique has found many proponents (59 162 167 172 173). Brown (163 164) in 1917 suggested splitting the rib and leaving the inner lamina as protection for the thoracic contents. Others (165 166 169 170 171) have split the rib to gain more grafting material without seriously decreasing its strength (Fig 8). The following case will illustrate the use of a rib graft.

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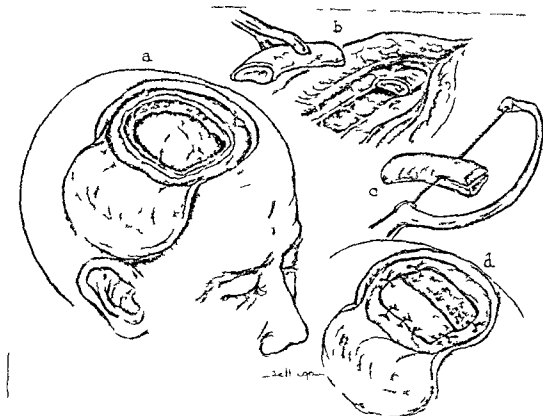


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(Fig 9)

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Ilium grafts The ilium was apparently not used as a source of bone for cranioplasty until Mauculae (177) in 1714 reported a cranial defect with a graft from the costal cartilage of the ilium. Phemister (180) used the outer table and Packerill (8) the internal table of the ala of the ilium. Naffz (179) Mney (178) and others (69, 75, 76, 18) have also used this bone as a source of grafts for the repair of skull defect. It has been found finite advantages over the use of the tibia or rib in that large concavo-convex grafts may be obtained

which approximate the contour of the skull (Fig 10). The procedure has the disadvantage that two operative teams are necessary, the cranial and the thigh muscles and fracture of the pelvis may result if too strenuous activity is engaged in early. One of Monys (78) patients sustained fractured pelvis during convulsive attack soon after the operation.

Scapulae The scapulae as a source of bone for cranioplasty has the advantage that it is covered by perosteum on both sides and that relatively large pieces of bone may be obtained. Reyle (90) introduced its use in 1911 and since that time it has been used by a number of operators for cranioplasty (69, 183, 84, 185, 186, 19).

Sternum Muelle (187, 188) reported 7 cases of cranial defect repaired by grafts from the sternum in 1915. Westermann (191) mentions the sternum as a source of bone for cranioplasty. Muell (188) in 1919 reported 7 cases in which

sternal bone had been used for cranioplasty. It does not appear to have any advantage over bone from other sources and has not been frequently used (189).

Preserved bone The use of autogenous bone stored in a preservative and subsequently reimplanted in the skull dates from Macewen (85-86-87) who reported that bone kept in a corrosive sublimate solution might be successfully replaced in the skull (cf also Gerstein 193). In 1916 Westermann (191) suggested boiling the bone before replacing it. Kreider (194) used the novel method of storing the cranial bone in the abdominal wall until it was replaced at a secondary operation. Many surgeons have removed bone flaps stored them in alcohol or formalin and boiled and replaced them with satisfactory results but not a few have had to remove the bone subsequently because of a draining sinus.

Cartilage The use of cartilage to repair cranial defects was popularized by the work of Morestin (216) in 915. Because cartilage as easily molded and relatively resistant to infection it was enthusiastically received (78-196-197-198-199-201-202-203-204-205-206-207-208-211-212-213-215-217-218-219-220-221-222-224-225-226-227-229-230-233-234-235-236). Among 66 cases in which it was used Laqueur (210) reported only 1 failure. Chutro (200) reported 54 cases with primary healing in all instances. Juliard (209) examined 39 cases in which cartilage had been used for cranioplasty ten or more years previously. He found the defect firmly filled in and the contour normal in 35 cases although in 15 cases small areas of cartilage appeared to have been absorbed. This is not surprising in view of the fate of the graft described by Leriche and Policar (214) who studied 2 cases thirty-six and three hundred and two days after cartilaginous cranioplasty. The hyaline cartilage had undergone degeneration and was being reabsorbed and invaded by connective tissue. The fibrocartilage appeared to be living but it was being invaded by connective tissue from the host. Cartilage is useful if at all at the present time for cranioplasty because of its flexibility (9) its tendency to warp (223) and the relatively small amount of it available. There is no reason to believe that it has any advantage over bone.

Fascia The use of temporal muscle and fascia to cover defects of the skull was suggested by Beck (237) in 1906. Various plastic repairs with pericranium or scalp have been proposed (238-240-374-377) but these methods have limited application to small defects of the bone which usually require no repair.



Fig 9 (Case 3) Postoperative photograph of the skull showing the graft.

HOMOGENEOUS GRAFTS

Cadaveric grafts Homogenous sources for bone to repair cranial defects have been limited to cadavers. During the first World War Sicard and Dambrin (247) performed 10 cranioplasties using autopsy skull bones which had been placed in xylol then formaldehyde and sterilized by moist heat at the time of operation. They reported no reaction of the tissues and no absorption of the bone (241-244-245-246-248-249-250). Unfortunately however a late follow up of these cases is not available. In 1933 Pankratiev (243) from Russia reported 4 cases of skull defect repaired by cadaver grafts. Gurdjian (242) used boiled bone from an autopsy case in 2 instances in 1 of which the bone was absorbed.

HETEROGENEOUS GRAFTS

Osseous grafts From time to time bone from lower animals has been transplanted into other species including man. In 1893 Ricard (256) put bone from a dog into the human skull. Schmidt (271) in 1893 transplanted fresh and decalcified bone from the rabbit to the dog and vice versa. The grafts were well tolerated by the host. Kuettnner (254) successfully grafted bones from apes to man.

Senn (257) in 1889 attempted to fill aseptic osseous cavities in dogs with decalcified tibia. Although the graft was absorbed it served for a matrix upon which new bone was laid down.

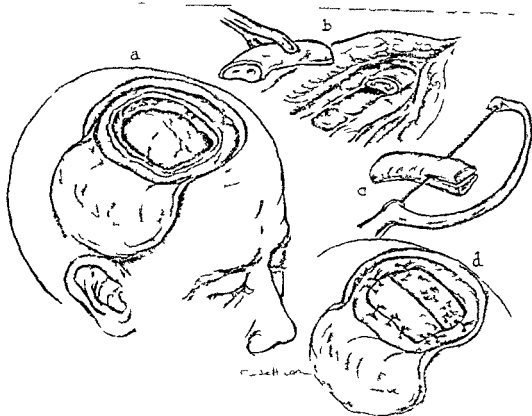


Fig 8 Ill t tu h gth tech q f p p
th k ll () bt m g p f b (b) plbt t ()

d pau gth d f t with th pces f nb (d)

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segm t f th rib Th was th t t fit th d f t
Al g th p nph ry f th g ft d th m gun f th
d f t w pl d m ll drill h l th h wh h lk
t w ins t d t fix th g ft pl Th calp
w l d w th tw l y rs f l k s t sw th t d g
(Fig 9)

Th w und h led by p m ry t t th t th
ccumul ti f flu i be eath th scalp At th tum f
th p u t d sch g th f th pot p t d y
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Ilium grafts The ilium w s apparently not used as source f bone for c n opl sty until Mauclaire (177) in 9 4 ep ired a cran al def ct with a g ft from the crest of the il m Plemister (180) used the outer table and P ck ll (8) the internal table of the l of the ilium Naffiz oe (179) Mon v (178) nd th s (6) 175 176 18) ha e also used this bon a a u e of grafts for the r pa f skull defects It ha c tan definite ad ant ges er th e of the t b r o rib in that la ge concavo-conve grafts mav be obta ned

which pproximate the contour f the sk ll (Fi 10) The p cedure has the d sadv tage that tw ope ati e teams are necessary the convalescence s del yed b cause of the weakness of the h muscles and fracture of the pel s mav result if too strenuous act vity is en ged in early One f Money s (8) patient sustan d a fractured pel is d ring a convulsive ttack soon after the operation

Scap la g ft The scapula a a so rce of bon f r cranioplasty ha the ad antage that it is co ered by per o teum on both s des a d that rela tively la ge p ces of bone may be obtained R eple (190) introd ed its use in 19 a d since th t time it h s been u d by a number of ope rators for cran oplaty (69 83 184 185 186 01)

Ster im g afis M eller (87 188) reported 2 cases of cran i defect epaired by graft fr m t. st num in 9 5 Weste mann (9) ment ons th st num as a source of bone fo cr ni plasty Mueller (188) in 9 9 reported 7 ca es in which

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Fig 9 (C) 3) Post ro t n oe tg gram f th
sk ll h g th b graft

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Cadaver grafts Homogenous sources for bone to repair cranial defects have been limited to cadavers. During the first World War Sicard and Dambrin (247) performed 107 cranioplasties using autopsy skull bones which had been placed in xylol then formaldehyde and sterilized by moist heat at the time of operation. They reported no reaction of the tissues and no absorption of the bone (241-244-45-246-248-249-250). Unfortunately however a late follow up of these cases is not available. In 1933 Pankratiev (243) from Russia reported 4 cases of skull defect repaired by cadaver grafts. Gurdjan (242) used boiled bone from an autopsy case in 2 instances in 1 of which the bone was absorbed.

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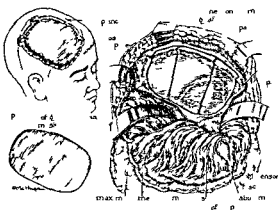


Fig. 1. Skull of a human. The skull is shown in a cross-section. The labels are: a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z. The skull is shown in a cross-section. The labels are: a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z.

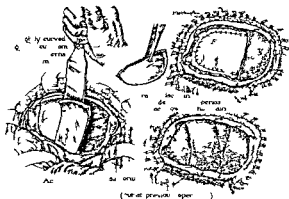


Fig. 2. Skull of a human. The skull is shown in a cross-section. The labels are: a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z. The skull is shown in a cross-section. The labels are: a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z.

ported use of this metal for cranioplasty was by Elsberg (313) in 1908.

Platinum. Cornioly (309) put in a platinum plate which remained for fourteen months without reaction. The expense of this metal is a deterrent to its general use.

Lead. Danziger (310) suggested the use of lead for cranioplasty. It was used by Rouvillois (325) and Maucclair (321) but the latter's patient as might be expected developed lead intoxication. Because of its toxicity lead is not a satisfactory substance for cranioplasty.

Columbium. This element causes little reaction of the tissues experimentally but it has not yet been used clinically for cranioplasty because of the difficulty in manufacture.

Tantalum. Tantalum the seventy-third element of the periodic series is noted for its marked resistance to corrosion and chemical reactions. It is inert to most organic and inorganic acids reacting only with hydrofluoric acid, fuming sulfuric acid, alkalis and a few other chemicals (281, 282). Its physical properties are somewhat similar to mild steel and in the cold or annealed state it can be worked into various shapes cut and pierced. Being quite ductile it may be made into wire which can be tied or twisted.

Although tantalum has been produced since 1903 and used in industries in past decades it was not until 1941 that Burke (273) reported on its use for buried surgical appliances and sutures. Carney (275) demonstrated a slight weight loss of plates and crews of tantalum placed against bone and in the abdominal wall although no gross change of appearance was noted. It is stated that roentgenograms of the adjacent bone revealed increased density but microscopic examination of

the decalcified bone showed no change in its structure.

The tissue reaction to tantalum has been studied in both animals and man. Pudenz and O'Leary (285) in 1942 found only a minimal connective tissue or glial response to intracranial implantation of tantalum in the form of foil or clips (283, 284). Tantalum plates used to repair skull defects in cats caused a delicate translucent slightly adherent membrane to be formed about the graft. Within eleven months the capsule did not thicken appreciably. This is in keeping with Carney's description of the reaction to tantalum implanted in the abdominal wall. Biopsies of the scalp overlying an implanted tantalum plate in man (277, 279) and of peripheral nerves ensheathed in tantalum foil (288, 289) have shown little reaction although the tissue is quite adherent to the metal (277). Lind (288, p. 1502) in describing the histological structure of the tissue about a tantalum sleeve states that the layer of delicate connective tissue abutting the foil resembled the endothelium of a vessel. To date the only evidence that tantalum is not so inert as generally believed is that reported by Delarue, Linell and McKenzie (276). They implanted tantalum foil in the subdural space of dogs after traumatizing the underlying cerebral cortex and found that the foil was completely encapsulated by a fibrous membrane. In the animals surviving more than three months there was reactive thickening of both the overlying dura mater and the underlying leptomeninges.

A number of neurological surgeons have noted the fact that tantalum may remain in the tissues even in the presence of infection without the production of a foreign body reaction. The infection

may clear up by the use of chemotherapy or penicillin without removal of the plate (272 274 278)

Since tantalum cannot be shaped at the operating table except with great difficulty the plate must be preformed. Small plates may be beaten to a simple contour by hammering over a model made from a plaster of Paris impression of the patient's head in which the cranial defect has been corrected. This may be accomplished by building up the contour of the head with clay before the mold is made or filling in the defect in the positive impression. The first method is probably the simplest and has the added advantage that the margins of the defect are well delineated by particles of clay adhering to the plaster. Lipscomb and Grover (296) have made the positive mold from an impression obtained with sterile agar at a preliminary or first stage operation. This technique requires a second operative procedure for the insertion of the tantalum. Large plates require shaping in a negative mold made of stone fixed in a metal casting to prevent breakage. These plates may be compressed by a heavy rubber pad or by a positive stone impression as described by Schnitker and McCarthy (87). Crinkling of the margins of the plate may necessitate the removal of V shaped notches where the greatest curvature is present. This does not materially weaken the plate and allows easier manipulation if the contour is not perfect.

The plate is cut to allow a one eighth or one quarter inch margin about the entire defect. It is then perforated every 2 or 3 cm. with drill holes from 2 to 3 mm. in diameter. Oil films that have formed on the plate should be removed with ether or any oil solvent before sterilization.

There are several acceptable methods of mobilizing the plate. The simplest is to tie the plate to the margins of the skull with tantalum wire. Since the plate is only 0.5 inch in thickness it cannot be seen or felt through the scalp. When used in prominent areas such as over the forehead a ledge may be cut in the outer corner allowing the plate to fit flush with the skull. It may be held in place by wire sutures or bed or fixed by small triangular pieces of tantalum driven into the diploic bone (286) (Fig. 11). The edges points may be used as nails as they are driven into the skull at the edge of the plate and then sutured over the tantalum sheet. From three to six such points are usually sufficient to hold the plate firmly in place.

Tantalum. In 1936 Venables and Beahm (34) used the electrolytic method as a method of determining their corrosive and tissue reactions

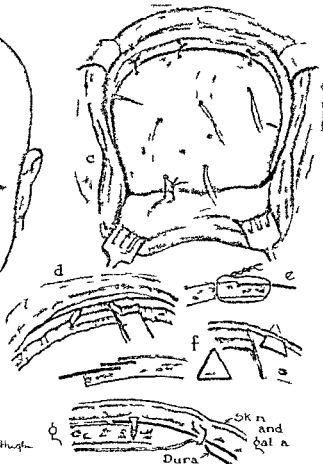
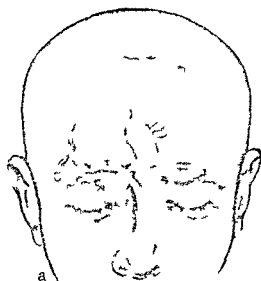
concluded that the alloy vitalium composed of cobalt chromium and molybdenum and which caused little or no electrolytic reaction was comparatively inert in vivo (299 300 301). Although it has been much discussed of the electrolytic method as a means of test for corrosion and tissue irritation (99) the inertness of vitalium has been fully substantiated (94 95 303 308). No undue reactions to it have been reported. Accidental infection not attributable to the plate have not prevented wound healing about the metal.

Geib (295) was the first to use vitalium in the repair of skull defects. Because of the rigidity of the alloy the plate had to be cast from a mold. Further shaping was allowed for by narrow slits cut radially about the periphery. In each of Geib's (95) 4 cases a slight accumulation of fluid beneath the flap required a pirionectomy the third or fourth postoperative day. At postmortem examination no patient exhibited any cranial plasticity the plate was found to have the same high lustre as when implanted. It was covered by soft fibrous tissue which peeled off easily. A small defect present at the primary operation had been closed by granulation from the margin of the dura mater. Tantalum has been used on a number of occasions with good results (297 98).

The necessity for casting the plate from a precise mold of the skull has prevented many neurosurgeons from using this technique (80 296). To avoid this difficulty Beck (9) suggested a stock supply of vitalium strips measuring 0.5 inch thickness and varied width and length which could be bent with pliers and used for a primary or neoplastic. These strips fashioned into the desired contour may be placed about the margin of the defect.

Titanium. In 1941 Campbell, Melowsky and Tompkins (38) reported on neither alloy titanium composed of nickel cobalt chromium and molybdenum. This alloy was shown to be practically inert and nontoxic. In a series of animal experiments they found that titanium (0.001) produced fibrous encapsulation very similar to that of tantalum which was used as a control. When embedded in the cerebral cortex a slight margin of tissue developed around the sac enclosing the metal. In the whole brain titanium is malleable. However its clinical application has not been reported.

Stainless steel. Boldy (66) has recently suggested the use of stainless steel wire mesh of varying gauze for the repair of small cranial defects. Such screens may be cut and molded at the operating table and are said to produce excellent cosmetic results.



Fg Sk t h h th t h q f ta tal m
na pl ty Th p f rm d pl t (b) mm b liz d
th d f t () by ch m th d h l g the t
tabl (d) th th t t g t th m g f th

k l l (c d) t i g t g u l p g s f t a t a l u m (f) r
 fast n u the p l t to the s k l l b y t a n t a l u m s c r (g) Th
 m t h o d f l m t u t h d d p b t h t h p l a t b y
 t u r f m t h d m a t t o t h c l p h (d g)

NONMETALLIC GRAFTS

Nonmetallic alloplastic grafts have been used to repair skull defects for many years with considerable success. Their light weight and flexibility have won many adherents for them. Some of the more recently developed plastics give even greater promise.

Celluloid The introduction of this plastic for the repair of cranial defects is generally attributed to Fraenkel (339 340 34 34 34) Due to its availability and flexibility it was enthusiastically received at first in Austria (337 338 349) then in Germany (343 346 353) and later elsewhere (333 335 34 353) Complications apparently were few but time revealed a few disadvantages of celluloid Although several operators have followed little reaction to the plastic on re-exploration after several years (354 355 360) Funke

(344-345) described a marked change in a plate used for cranioplasty five years previously. The celluloid was thinner and its smooth surface pitted. The plate had lost its elasticity, it was soft and so brittle it could be crumpled between the fingers. Chemical analysis showed that the plate had lost camphor. Experimentally, the tissue reaction to celluloid has been studied (347-350, 357) and shown to be rather slight. Six days after implantation the celluloid is surrounded by granulation tissue containing newly formed vessels and polymorphonuclear leucocytes. In four weeks the connective tissue has become laminated although it is still infiltrated by inflammatory cells. In eight weeks the plate is surrounded by a thin lamina of pseudo connective tissue (347). Following a craniial repair with celluloid however a serosanguineous exudate forms about the plate.

which requires almost daily aspiration for from one to two weeks. If infection does not result from this treatment (334) the plate usually becomes encapsulated with connective tissue. This immediate cellular reaction is much greater than that seen with autogenous or alloplastic cranoplasty using tantalum, vitallium or methacrylate. Before the introduction of these newer materials celluloid was used extensively (56, 112, 336, 348, 351, 352, 355, 356, 358, 361). Ney (355) reported a series of 300 cases of celluloid cranoplasty with only 5 infections. Four of the patients were subsequently reoperated upon with satisfactory results.

Methyl methacrylate. The acrylic resins have been known for many years but it was not until 1937 that they were generally used as industrial materials. Because of their properties it was soon recognized that they were ideal for dental prostheses. The lack of tissue reaction to these resins in the mouth suggested that they might be successfully implanted within the body for arthroplasty and cranioplasty.

The methyl methacrylate resins made from bases derived basically from coal, air and water. These are converted by high pressure methods into a clear liquid—methyl methacrylate monomer. The trade names under which this particular type of acrylic resin is known are Lucite, Lucit, Plexiglass or crystallite. In the processed form it has a tensile strength of from 4,000 to 7,000 pounds per square inch and compressive and flexural strength of from 6,000 to 15,000 pounds per square inch. The plastic begins to soften when heated to about 50° F. Methyl methacrylate is not affected by weak acids and alkalies but it is soluble in ketones, esters and aromatic hydrocarbons. The plastic absorbs small amounts of water without changing its chemical structure (365).

Kleinschmidt (370) was the first to report on the use of methyl methacrylate (plexiglass) in experimental animals. In January 1941 he presented plates of plexiglass 1 mm thickness in skull defect of rabbits. In ten days the reflex of the plate as a cover by intact cells living in a plasma mat. Collagen fibers appeared in the walls firmly enveloping the plate. Although the tissue adhered to the dura mater the subdural tracture showed no reaction. Kleinschmidt (370) stated that Zander was the first to use this plastic for human cranioplasty, reporting a defect in the frontal bone in October 1940. In this country orthopedic surgeons (367, 368, 372) introduced the newer plastic for arthroplasty. In this country methyl methacrylate has been used

for several years (175). Originally flat plates of lucite 2 mm in thickness were processed and then shaped by heating over a plaster mold. Because such plates tended to flatten during autoclaving the lucite is now processed in casts of the head much as dental molds are made. Gurdjian et al. (366) and Kahn (369) have used methacrylate successfully for cranoplasty with good cosmetic results. Kahn believes the material to be so inert that it may be inserted at the time of primary repair of a perforation without the head.

While acrylic resins are well tolerated by human and animal tissues (362, 363, 364, 370, 371) there is a definite encapsulation of the plate within a few weeks by hyaline connective tissue (F 12). Relatively little inflammatory reaction is present. That this tissue response is more than that seen when tantalum or vitallium is used cannot be stated from the few human cases in which they have been able to make biopsies. The plastic does not appear to invoke a foreign body reaction even in the presence of infection. We have seen an infected wound probably due to too early acrylic cranioplasty for a compound skull fracture clear up completely with local systemic penicillin therapy without removal of the plate. It is particularly noteworthy that following repair of a skull defect with a methacrylate plate a patient of fluid under the flap always required more than once and in some cases not at all.

The acrylic plate is cast from a mold of the patient's head. A plaster of Paris impression of the cranial defect and surrounding area is prepared and mold made of it. The mold is held by a red wax 5 mm to allow for the thickness of the scalp and the defect filled in to approximately 1 mm of the desired contour. Base plate wax is used to fill the defect. The mold is greased and the contents of the mold is prepared by making an impression of the mold and wax in the defect. Upon separation of the flask the wax is removed and the adjoining surfaces of the molds are smoothed by hand with sheets of fine paper.

The acrylic material prepared by methylol polymers (polyethylene glycol) is about 8 cc of the methylol material. A plate about 2 by 6 by 50 mm. The thickness of the material is placed in the mold and the concrete mold applied. The two are then impressed by heavy clamps and placed in water bath at approximately 100° F.

The following is a list of the authors who have used acrylic resins for cranioplasty: Gurdjian, Kahn, Ney, Kleinschmidt, Zander, and others. The following is a list of the authors who have used acrylic resins for arthroplasty: Gurdjian, Kahn, Ney, Kleinschmidt, Zander, and others.

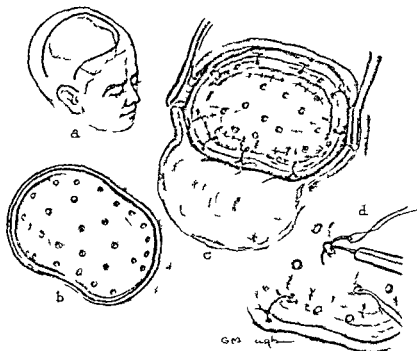


Fig 3 Sk th t h th t h q f ryl n pl t Aft fl t g th calp
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 tly d t b l d d l th th f f th t t bl th pl t fixed
 by t () Th m th d f l m t d d p b th th pl t by t g th
 dur t th und rf f th sc lp h th l h th nd m (d)

be removed in three or four days. If considerable fluid has accumulated under the scalp at this time it may be aspirated and the pressure dressing replaced. With osseous tantalum and methacrylate grafts aspiration is rarely required on more than one occasion at different times.

Since many cranioplasties are performed for the repair of cranial defects due to compound fracture of the skull in which a certain amount of infection has been present it seems advisable to prepare the patient for operation by systemic administration of moderate doses of penicillin and sulfadiazine. This is particularly imperative if the period of time since the infection has been short. The local application of these hemostatic agents in the wound has been recommended.

DISCUSSION

Perhaps the most striking finding in a review of cranial plasticity is the great tolerance of human tissues for foreign bodies (389). This is undoubtedly the reason that so many different types of graft have been tested and used for repair of the skull with successful results. To

choose the ideal from these is no easy task because none meets all the requirements of a perfect graft. However, for comparative purposes some appear to be more suitable than others.

There is no doubt that the alloplast fits can be molded to more complex contours and that a cosmetic result superior to that obtained by other types of graft. Such sharp points of the graft are especially necessary in the frontal region and for defects in this region all plastic grafts are particularly desirable. For defects in the parts of the skull where the cosmetic results are not so important the advantage of alloplast cranio-plasty is not so evident. The introduction of a foreign body even if it eventually may be resorbable for the development of carcinoma is a problem or rather equal. The lack of an immediate tissue reaction is especially important in animals. No guarantee that a late reaction may not occur. The somewhat simpler and more perfect procedure when a permanent plastic is used is not necessarily a more reasonable suggestion for cranial plasticity. Defects up to 8 cm in diameter may be repaired at a

single and not too lengthy operation with osseous grafts either from the skull, tibia, ilium or ribs. For repairs of smaller cranial defects the osteoperiosteal grafts from the outer table of the skull seem to be well suited. That osseous grafts are absorbed in 5 per cent of the cases does not seem to be a serious disadvantage. For the repair of large defects for which sufficient bone can be obtained only with difficulty the alloplastic grafts are desirable.

The choice of an alloplastic graft is not easy. Only celluloid which is obviously inferior to the newer plastics and metals has had the test of time. That all the others will remain inert in the tissue for from forty to fifty years remains to be determined. All of the newer materials—tantalum, vitallium, ticonium and methacrylate—appear to cause relatively little immediate tissue reaction. The metals and alloys have one distinct disadvantage not possessed by the plastics, namely their radio-opacity. If roentgenograms of the skull are not required following craniotomy this is of no consequence, but if a complication develops the large mass of radio-opaque material is a severe handicap to adequate roentgenographic examination (Fig. 14). In cases in which the dura mater has not been penetrated late sequelae such as epilepsy are unlikely, therefore metal plates may be used for repair of the skull defects with little chance of their interference with subsequent roentgenography. However in those cases in which the dura mater has been penetrated of which about 40 per cent will probably develop epilepsy a radiolucent graft such as methacrylate would seem desirable. Although both plastic and tantalum plates appear to modify the electroencephalogram the alterations do not seem to be sufficient to interfere seriously with the interpretation of the record. Perhaps as the result of World War II more definite information on the advantages and disadvantages of the various methods of grafting will be made available. At the present time the choice of graft appears to be largely a matter of personal experience and opinion.

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Fig. 4. Roentgenogram of skull which was removed from the patient. The skull was removed from the patient. The skull was removed from the patient.

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JOHN R L D M D

NOSE AND SINUSES

McM h n B J Th t tment of Sinu iti in
Children Orl Rh l 944 53 644

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J H V F D LPH M D

Dysa t B R D abeti Gang ne Invol ing the
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PHARYNX

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JOHN F D H MD

Arbuckle M F Stut m n A C d Moo S
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NOAH D F T MD

NECK

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JOHN F D LP MD

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Hermann L G and Gibb E W Phant m
Limb P in It Relation t th T m nt f
L rge N r es t th Tim of Amput tion Am
J S g 945 67 68

Phantom limb pain is discussed by the authors
who present the opinion that phantom limb (at least in
part) may be due to peripheral retraction. They do
not believe that these symptoms are purely psychic
or in but that they have an organic background.
Arguments in favor of a central origin are supported
by the statement that the clinical picture of a neuroma should
be verified from the pain if it is a peripheral origin
but such neurotomas are seldom met with. The
factory results of studies made to indicate that the
malreflex from the peripheral to the higher centers
of the central nervous system tend to become fixed
or reversible with a short time after the
traumatic amputation with subsequent removal
of the organ. List of statistics on does of always com-
pletely abolished these malreflexes.

The incidence of phantom limb sensations is
varies considerably according to reports from 5 to
98 per cent. In these series the authors deal only with
phantom limb pain in a differential manner in phantom
limb sensation. Secondary malreflexes are
occur in due to primary secondary atypical
thrombosis produced at the site of the phantom
limb pain. The clinical angles from 25
per cent.

The average clinical picture of phantom limb pain
in these series of patients who have received amputation
of an extremity after followed up by an adequate
period of time is 58 per cent.

The authors express the opinion that the most
probable primary cause of phantom limb sensation
is results from retraction of the centrally located
sensory neurons. The malreflexes are
a reflexly cutaneous reflex. Such a reflex may be
brought into the high center of the sensory
which has been eliminated. The sensory
retraction is present in the abnormal reflexes
than the pain center which the provokes may cause
the satisfaction of the patient even after all
known afferent pathways from the extremity have
been severed.

The various possible methods of treatment of the
peripheral nerves at the time of amputation were
again reviewed. The method employed by the
authors is attempted to prevent the generation of
a new sensory unit. The sensory unit is
absorbable ligature tightly around the
trunk about the base of the site of ampu-
tation. The ligature is a double strand of
nutrient artery and cause a narrow infarction
of the nerve in the double ligation. The
histological study made upon the nerves

treated in this manner was a gradual replacement of
the area of pressure necrosis by fibrous tissue until
after about one month the epineurium completely
encases the end of the nerve except for a small area
of dense fibrous tissue at the terminal end. The dis-
tal portion of the nerve is resected with the scalp
just below the point of ligation.

Of 11 patients 113 are adequately followed up.
They experience no phantom limb pain following
operation by this method. Analysis of the 7 pa-
tient who complained of phantom limb pain re-
vealed that all but one were in the sixth or seventh
decade of life and that 5 of the 7 had undergone du-
rable insufficiency while the double ligation of the
arterial thrombosis in the extremity.

HOWARD A BROWN M D

BRAIN AND ITS COVERINGS CRANIAL NERVES

Adler A Mental Symptom following Head In-
jury A Study of the Clinical of 200 Cases A
Review of the Psychiatric 945 53 34

A review of the psychiatric aspect of 200 cases of
head injury given as a part of other neurological
studies in connection with the same series of cases
which had been reported elsewhere. The patients
ranged from fifteen to fifty years of age and pre-
sented head injuries which varied in degree of
severity.

Post-traumatic mental symptoms developed in
31.5 per cent of these cases. Certain preliminary
preliminary factors seemed to play a part in the
development of the post-traumatic mental symptoms.
Among these are listed as follows: advanced age, mar-
ried status, military service, and stock exchange
speculation. A preliminary statistical study of the
whole series of symptoms showed a separation of the group
of patients with multiple head injuries and
dissociation.

The symptoms developed in the review were the
following: nervousness, fatigue, concentration fear,
anxiety, depression, hypochondriasis, obsessions,
compulsions, hysterical personality change,
hypomania and euphoria. Post-traumatic anxiety
was the largest group, the statistical study of the
frequency of multiple head injuries and dissociation
in the common mental symptoms in the series.
These are the patients.

HOWARD A BROWN M D

Gidding D Histamine A F and Marx H R
Diagnosis of Meningitis and Secondary Infection
in Infants and Children A Review of the
Literature Since the Introduction of Sulfonamide
Therapy in Meningococcal Infection J Pediatr
S L o 945 6

The review pertains to the clinical picture of menin-
gococcal infection from St Louis. The first clinical cases

treated at the Child n s Hospital a d th second
de ls ith 9 cases see at th Isol ton H spl l
It is pa tly a st t st c l report as seen by the
el bo ate and e tensive tables Each ca has its
principal at r s tl d t t bular form

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A d v n z M D

N J n R A a n d D n L A t S y p h i l l i t c
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H a r d A B M D

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More extensive l s s equ res a transplant Suc
cessful tech q e embrac s the sutu ng of the nerve
sheath only av dance of to sion a d angulat on
and abse c of infect o JOHN R L NDSAY M D

SPINAL CORD AND ITS COVERINGS

Raaf J T e tment f the Pati nt with Spin l
Cord Inj ry Am J Su g 945 67 63

On th basis of 63 ca es of sp al rd jury an
attempt is m de t rati n l e th treatm nt The
ca sared vid d nt n cut eries of 33 seen f om
one h ur t thirt n days afte the injury and a
ch onic series f 3 ca s s from n month to
fiftee y ars after the j ry Th fi t 33 cas smu t
be th true bas s for the sug ted tr atm nt

The sympt mat lo y notent d it but em
phasis is la do caref l handling and t p riat on
of the pat ent Wh n sh ck has b en rel ved the
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aga t m n d iate l m ct my nd ff the fl
low g nd cat n f r m m d te p ti n ()
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cod les n is pr es g (2) n i complet c d
lesi n w th vide ce of press th c rd a d
c ted by ro ngenog am spu al fi d bl k (3) th
dem str t n that th pi al fluid pathway h h
was op f llov g i j y i b com g bl ck d

Stabi at on of th pi ft r f ctur d i c t
surged and m thod are desc bed f th red ct
of deform te n th p s c of a s v e ou
lesion Ther s a d s c s of th c e f tl p a
ly d blade by the t dal ve n thod Att to
dra to the n c sty f pe fo m g ly sup
pub c ystot my hen t a portat may b
l ngthy and wh n th e not ad quate pers el to
car f a ind vell gu thral cath ter

W D V N M D

M nr D The Di gn sis of P t i He ni ti n
of the Lumb Int t b l Discs V E gl d
J M 945 23 140

M r b l ves that the diag os f p t r
he nated i t r r t e b r l d c w h b d o ly
the h t r y d phvs l and o gal mi
t s i f u c n f m l b y my log r a p h y t b to ly
a p s ble T p r all is r f c h h
th h t r y a l j h c l f i n g u l d g l l y b
s d r d t j t y i a d g f f r a d l m b
r a l y e d l i j s a h a
t n w a p r v d to h b e l t b p t
Th comp r bl r i a l l f
(1) 3 ca es f su p e c t d t t b l d f
wh h r r r i gat c b y p t () o
case f com p es f the lumb o t b y a n l
dural en l p e a l c l c l t g f n a f r
t red l m b r v r t br (4 f th s l l b y p
t n) (3) 4 cases f qu s t n b l d l l l
f i d by op rat (4) 2 ca b th p e r a t e d p f
cong ital d f c t s th t h r d m trabl f
2 a a l (5) 3 c s s of b k t a

Th ge and sex of the patie t with back or le
pain or the durati n of the pain were f no a d in
dist gush the hern ated d sc cases The h story
of a lift ng str a back injury or a fall as the pre
cipitating cause of the syndrome s in favor of hernia
ti n but by o means excl des the co diti ns found
n the second se es of cases

Recurr nt attacks of pain in the lo e back a d
leg occur g first a pain n th low back which s
ncreased by c gh g sneezing or tra n and
rel ved by est r orth ped c tr atme t are some
v hat mo e ind cative of a h nated l mbar d sc th n
of the oth c nd ition Th subjective symptoms
appear d to be of no valu n ascertain g the l vel at
wh ch the di c was ruptured when rupture xisted

Lo back s gns such as lumba muscle spasm
alteration of the lumbar curve and/or local tend r
n s were f no d fferent al value in the two s ies
It i of int est that the e was an ab e ce flow back
s ns e clus ve of local tend ne s in one fifth of the
p ed d sand in o e th d of the other condit ons
The pres nc or absenc of a pos tiv reaction to the
straight leg ais gor La u test was lik e f no
diff ent l v lue Test which produc t mporary
i creas of the i trac ani l pressu e such as c ugh
ing st aining o ju lar ompres on and r sult in a
accentuat on of p i we of co d able diff ren
t al di agn tic importa ce b i f u d pos tive in 86
p ce t of the hern at d disc s as oppo s d to 44
percent for th ther ser s The p e nc or abe ce
of moto w kn s s o refle changes in th involv d
l m b w s of no d agnost ch l p d about on half of
th patients w th v r s i d disc herniat o had orm l
Ach ill s fle s Muscula at ophy as 3 t mes mo e
p eval e t i the pr ved herniat on group

Obje tiv se o ry ch nges were abs nt in 37 p r
c t f the pr ved her ation a d in 47 p cent of
th other co diti o a d h n prese t e n ther
f d f f ent al nor of local z i g s g i tanc e

W th r ar f to local zat on f th l v l f th
hern tion i th v i f d se es obj ct s n o y
h a g th p se c or b e c of pos ti e Las gu
g n o obj t motor ak e wa f n help
Loss of th a kle je k as ob r v d n on half of the
l m b sacral up tu es but in nly o e th d of th
f u th l m b d c h n t i Atr phy was t c
f qu nt i f urth lumb r d c r p t u e a
l m b acral rupt es C r b r o s i a l l u i d t u d s
w e of l g o stic h l p

C t i l g s of the p e nc of p st
h t d l s f m l t p h ated l e s and th
l l f th h r ation r h m a t i n s d p c d u j n
v log phy A 2 p e c nt solution of k od n n
t l l ed in tr th ally th most sat sfa t y e nt a t
m l m M s i n o The i j c t i m a t r l
a j r r tly fill the f al subarachn d path ays
t r l y th for fluo sc py i n t e q u r d d
th l t n s t i l y b o b d n t ho r s l t
ca s s l y a n e q u a n t i l a m n f m n g e l
t a t b t p i n a l a n l e s a mu t f i r s t b d l
A d t a l e d l e s c p t o n f th use f s k o d a n m y
l a p h y i s t b e r e p o t d i a n th r p u b l c a t

The cl on reach d th tel cl am at on
l ad t the susp c f the pr ce of a post r
herniat n f l mbar d c nd c t t myel g
raphy p oves or d p s the susp on and d t
mines the l el f the her at when it s present
H v \ S M MD

Ehnl G and Lo J G Intra pin l Lipoma
Repo t f Ca R i w of th Lit ratu e and
Clinical and P thological Study f h N
P j h f Ch 945 53

Very cl set i p c t of intrasp alt mors are
l pom s Th e fiths of the l p mas e intradural
a d t o fiths are e trad ral

Th d t b ton b t een the sexes is ab t q l
for both v arieties of intrasp al l p mas

The nset fsymptom f t d l lipom s with
fewe cept o s b fo eth ge of two or three years
at the beg ning of the th rd or fifth decade Symp
tom of t ad al l p mas app ar at a yag

The dur tion of symptoms of t d l lipom s
(before death or surgical removal) r nges f om few
months to mo e tha ftee years The median
durat on is abo t fo ry a s The durat of symp
tom f extradur l lipom u ally sh rt the
medi n b g about one ye

The cl ncal presson of ntr d al l p ma s
d t ctive fo fiv reas s () d fnt o t pa s
are c mmon d p t the very feq t v le
ment of ts in the t m (2) ataxia of the t m
t s due to d fct fpo to s seioacca o llo
of the first m festatio of the l pom (3)

lat l flaccid p alyss of n a m assoc t d w th
sp st paralysis of the legs h bee obs rv d (4)
c mplt uba chn d blk ck is usual d p t the
large suz t which th tumors g w (5) d ver
ble ch ges i th p al ro tg g m may be
bsent b t n th th r hand th sp n l a almy
b wid ned th o h a c s d bled t

Int dur l lip mas ccu m t comm ly the
erv tho c g n of th p al co d Et d ral
l pom as m t comm n the l w r pa t f th
th acc g n

All but f the int d l lip m we e m
p d f d l ad p t f d l ad p t
s w th cessiv fib tr m Oly h lf f th
t adural l pom w re f d l t d p set ue M t
f th rem nder w ng mato A few we
my m t u On as femby c f t

R t r v rs d th nt d all poma in m t of
th es d t w mmon t the fty g n
s h nt m t l t t th fine trut f th
t t l d t th uppo t th t th f t d v l
p d w th th o t d d d nt filtrat it
nd nly

I tr d al l p m nv ably f d t b
p t d f m th e lt e by laye of fib
t of p l d t n A p l h th c rs the
f rf f th t m Th f th t

d l lip m f p l g n t d w th p l lip m
Th c ct t t d w th p l lip m
how t ch g f a p l f t t ()

th nd m f t v rs ot p l d rat s
fo m p m c t f ib oc llular m w th th l po
ma () the p l ptum b t the t m a d th
c d thick d s d h v y e te ns nt th
c d a d (3) th p al cap l over the f e d th
tum r th i ke s and m y b come adh t to the
arach o d and d

The ppar t v n s of the c ect l a
with regard t th co d is probably ta express
of mal g cy

P l lipom s p obably arise because of local fail
of o mal contr l er f rmat n of f t f m the
no maily prent p ncap l lary m chym l c k
In thes cells wh ch fat f m p t t hu
apa c l ad p f th p ap c d t de l p
Wh th th n pl t c s a m l f m th n
o h th th y d f f c e b t w c the t
is an op n q to

Extrad l lipom m relat d t m agu
d fct of the p m t v f t f m m t s l f

N ther form of l p m s relat d t m m m m
Th is a clo l t sh p b t w e l p m a d
g mas I t aspin l lip mas ppe t be l t d
to fib m to d the th r pha m to s

Co tal def ct rath th r s c t d w th
int d ral l p m Obes ty d m l t l p o as
occas o lly accomp y th tr d ral l p m s

MISCELLANEOUS

J d vi h B S m t P in D gn t c d Th
pe ti A pe t f Loc II filtrat 4 J M
S 945 09 4

I cas s of mat c p n t d m th m
f cto f r d t m n wh th r j t sh l d
be g ven l cally o wheth a par r b l n
blo k sh l d b d S p r f al t d m is ten
d m f th lunt p ch l l as hyp ral ges a
t p p ck p st k D ep sk nt dem is
l c t d only by p l g o pr g th sk firmly
ag st m le bo trut e d t hyp
p k p h g Th latt f t n o t l ke d
d q e tly th d n s f n al ma may be
el ok d

Jud v h d v d pa to the m j e t p e
l c l t sm t t d a d fle P f th l cal
ty l m t t d g th r w th the a m p ny
t d to th a of vol eme t E amples f
th type fib t my t d t nd t s

T m t t d p d al g th r e fa
rv w th th gme talo p pheral knp t
t m w h h d te m d by th t b t ft
d m Th m pl ot r tru k t t as m
bd m l ch t l g a sci t bra h l
pl n l g o p t l l o m

R f p p f r r d f om m t t d
m t u t ct t d t t w th th a s
s g m t l n r v t Th f ed pain s n t
c t d w th t d

S mat pa m y b c mb d w th ymp th uc
pan d lt n f g l l p ture A
p t c te cale mu l may b d nly

affected by local shoulder joint lesions. A b. tendons r. fibrous. If we ever local infiltration into the scaleus anticus muscle will be in the scapula inferiorly, vicularly, arm, and ar. as

If any other local abutment shoulder joint is present it will not be relieved and it can then be sharply localized the overlap of vascular and neuralgia pain and tenderness of the scalenus syndrome having been eradicated from the being.

Low back pain subdivided into the type with and those without radiation. Radiating pain may be reflex, traumatic type. If the reflexed as pain at tenderness the tension of the type which lies there is retrocurvature and that therapy should be directed to the place. Paravertebral tenderness will be found at the local spreading to the peripheral distribution. Local infiltration in such situations would be of a local low back pain without radiation and this is a local tender area found to most reflexes and local infiltration should be sed.

In instances of segmental neuralgia local infiltration into the peripheral area of pain may cause cessation of pain in the segment. However this will be only temporary and a paravertebral infiltration

of the involved nerve trunk will yield more satisfactory result.

Differentiation of the source of pain according to the presence or absence of tenderness has been found to be more accurate than attention to the area of pain. Thus segmental pain in a definite case may persist for months or years after the subsidence of the acute symptoms of a back injury. Efforts to relieve area of pain by local infiltration peripherally are of little use. However paravertebral blocks of the nerve trunks responsible for the segmental tenderness will result in prolonged relief often curing the complaint of pain.

Failure to obtain relief of pain following paravertebral block may be due to improper infiltration of the nerve trunk. This would be recalled by failure to relieve segmental tenderness. Should segmental tenderness disappear and pain still persist it may be caused by (1) a lesion proximal to the point of infiltration which would be intraspinal such as a cord tumor or herniated intervertebral disc (2) local lesion relapsed by a zone of segmental neuralgia (3) a visceral lesion associated with the segmental neuralgia or (4) unrelievedness of the part of the patient to admit relief as in compensation problems.

HENRY A. SHENKIN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Lubs hit K P g t Di of the Nipple with
Special R f n t It Co rs and T atment
A t d l St kh 944 5 7

During the p od f m 9 g t 942 the n mb
of cases f ca cer of the b st t d at the Radium
Ce ter in C p hage as 967 amo g th m were
27 ca es (29 per c t) f Pag t s d se se The pa
t ents all men from th t v nine to ighty
y ars ld mo t f th m between st ty a d ei bty
In all ca es e cept r th dag os s w v fied by
h t logical xam nation

Probably the P g t c ll are cell the o fic s of
the milk d ts r the ud ferous glands v h b be
com cance iz d and v d the epid rm s Such a
cance at n m y cur s m ltaneously r succ
s v l t v us po t f the ca al syst m f m d
by th milk d cts and th r aci toward the sur
face of the ski h eit g sr e to the eczemat us
ch ge i the l t t and t ard th de pe l yers
h t at frst m y pers st a preca us ch ge
i the p th l m of th milk d cts d nly l ter
g e r t the f mat on f ap l pabl t m r wh n
th cells b ak th ugh the b l membrane nd
beg n to infiltrate the s di gs As a rule the
a ce ed c ll in th deep p t f th mlk d ts
d not a sum the f rm and type of Pag t cells

It foll s f om the f ego g th t ly a la
t v l y l t g f P t s d ase can we xpe t to
f id tum f m t n the b ast by p l p a o b t
by t pa to d m cop b op y d m strabl
ch es n th d pth may b y d e f r— th
fo m f t m ll h g i the e p th l m f
th d ts— d th f t a t m mo f r bl
f th st t t f th py It m t ot b
p ct d h we th t th t ph g w ll alway
g v a p t i l t In d b tful es s c d
b p y h ld b p f m d

W th th c p t f B l dgo d h e p ess d
the b l f th t aly tag the d m y b
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h w v d n t pp t h b tho hly
t d n l g cal ywh

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t w p r f m d l t b ca f rr Of
th 7 p t ts 43 p t l v fiv y rs ft
th t eatment Of th s t t d with ray 63 p
c t w r l v ft th fiv y p d

A mp f th es lt bta d th t t
m nt f P t d d f p bl b t

ca c h w that regard t the lastn re ults
th od ff c b twe the f rmer a d pe
able m mm ry ca ma t at d with radcal
pe at n and po top rat v rrad at (33 percent
of t tal f a o c s ympt m free f f i
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of 3 cases w ympt m f f f i y ars)
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w th th t chn q w ns d d m d quat
mo th sympt m t eff ts bta d ussu-
mu h 5 f 4 ca s d t b ck m th f i
ye rs to l y th P t f f i t th b ast as
c m p l t ly h l d b t f a d rabl mb of
y rs n t mo f r m t ha app d th d pe
part f th m mm ry gl d
J E P K NAR MD

TRACHEA LUNGS AND PLEURA

O h l t R H nd W l n N J Pulm ry R
ecti n in th T tm nt f T bercu l J
Thor S g 94 4 55
Res t f t b l t p oced
w th ch m f f ty th t t h uld b n
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t b g t a pl f tr tm t f t b
culos Th e t p t f l g t n l e d b
t b culos t d l f t 88 Block
m d th first tt m p t p f m ch pe t
H v most f th po ts pulm r e
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h t l t l b t d mp m d b
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t pe c a d po t sh b n much m
n rag g
Th d l pm t f pe t t ch q e
esp lly th f d l l g t t h q f t at

g the h lum nd th pleural fl p m thod of cl g
 1 b onchus h s made the ope ative p ocEDURE
 uch saf r and has g eatly educ d complication
 The p es t report deals w th 63 ulm ary res c
 on pe fo med pon 6 pati ts ith pulmonary
 ib rculos s fom 934 t July 943 Th first
 oup f 18 j t nts w op rate l up n befo e Ja
 ary 1942 v h ca w n t s standard el as
 th s c ndg oup f 45 es ct n p f m ds ce
 1 ary 942 Of the 63 ojer t 35 i n u
 1 nect mies d 8 were l bect m es Th ge of
 3 p t i s var ed f m hft t fity en m t
 f them bei g b t t nty a d f t years f age
 fty-one f th patie ts e e me T nty thr e
 tents o 37 p cent had e j bronchial t be
 ulo s Fity e or go per cent had post e
 putum at the tim f es ction

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 uppu at ed e oca es un t olled d se e
 oll i g th ac pl tv i i ext s v mult
 sbar p dom natelv nil te al t b c l is 7
 ases p dom ately n l ha t b cul n 5 ca e
 asal disease in 7 ca e and ecu t h mo rh ge
 ollo g tho oplasty t be cul and act li
 ase f llo ing cav nost my n ca e a h

C mpl cat n h v bee r luc d m te ially ce
 re jou r port. In the gr p f 8 esect ns done
 f e Ja arv 194 there v r 7 cas f empy
 m 5 cases f pman t hst la and 3 ca e fun
 al ral p ad I th 45 r sect s do e J n
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 and only pe ma e t f tula Th total p r tve
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 lity 24 6 p e t How th oper t m tal
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 to 43 7 per c t for the de pe te case Th ca
 m tal ty f r r a onabler k 33 pe e t a d
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 mo tal ty was 1 per cent th 55 p r t f r
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 Of 5 ca lya l l ed at h 7 r duet t b culo
 sa d 8 to ther cause

Of th 46 m ingpat is 34 e l call ell
 T nty s h e etu ned t m l t t a d
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 ppe lobe followi gl b c tomy f th r ght l e lobe
 and is no v ell f l l ingl bect my f th ght p
 per and middl l bes O e p at i a resp t v
 c ppl and h s a empyem nd a f i tula Th
 ma ng patie t rec ntly d l ped a b o ch al f t
 la and empyema i m th aft p m ct my
 It sbel v d th t re ect of th t b reul i g
 does n t p es t l tech cal d f fult es While
 c mpl catio s h v b n r d ced c t alar r l
 p ad and ulcerat of the br chial st mp ema n

as ha ard Act v di ca e t l erculous b onch tis
 o a controll d contral teral di ease are not consid
 ed c nt aind c tions to v ection R sect on should
 be employ d a definit v the apy be re the compli
 cat s of th oig n l d s ase d velop

THOMAS F THORN N J M D

Sto k y P F Lockwood I H Mant H L
 Buckingham W W and Othe P ni illin
 Th rapy in B nchie tal i S // H J 945
 38 93

Bact i l g cal f li g in th sp ta of 21 ch c
 c phers (tr chuct sis br chiti a d allerg c
 br ch tis) d m strat d that l ttle aid w uld attain
 f m the u e of sulf drugs This ha be n b ne out
 n cl cal pact ce One r mo e path gens we e
 u ually p es t St phyloc cci w e the most co
 istent a d pers te t of th patho ens and n t n
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 m n c mbi at was one fo m of the staphylococcus
 th t ptoc c us vir d ns

Tenty-o ca es r ce dan v age of 1000 o
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 n the umb r f hem lytic str ptoc occ a d sta
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 br ch tis ass cat l th pe ods of ctivity and
 r miss ong v th best h pe f th ap ut c r pons
 The tue b h ctat sho d littl r no spo e
 to p c l l n T om s F th ENTO JR. M D

Ty n M D nd Millik n N T T tal Pneum
 nectomy f B lgn Br nchial Ad n m Case
 R p t 1 m J S g 945 67

Tho gh b ch lad oma has b come definitely
 s p rat d f m b onch al cancer a d other b n gn
 b nch l t m rs om pect f the l f e hist ry f
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 k n that the l n sl wly p gr ve occ rs
 i the maj ty f ca i men i the th d or
 fou th d cad flif and that in most instances the
 chi f d g l es in the sfects f b onch al ob tru
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rying p n n as t the oign d path g nes
 f thi m n Offlate thr ha b en a s v ng t a d
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 s chases d th frequ ntly pot d t atm nt f
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 bi ed w th d p r y th apy or d ct rad m im
 pl t t should cert nly be q est n d l l te
 ye s ther hav been a good many surgeon who

the size of the thoracic cage at s ch a t m l d
not h b e t t

It has been c r f v r c t h j a t n t a
p t d u i a d h v t h v i y f a g
H only u b y c t d i f f i c u l t y t h a t f h l k a j
i d l y u p a s t e p h i l l t h r i o m e h t s f i r t h a
a d h e e z g T h e e i n c i d c f r c n c r
m e t a s t a S h e i a b l t o c a r y u t h r h k
a d h d u t e s a s t e l p h o n p e a t r t h o t
p i a t y m l a a s s e m t S h e h a d a m a l d e r v
a d p e p u m A p r i l 1944 T h i c t c a l c a
t l i w h e t h e r t h e l u g t i s u i n t h s a l l e n t u a l l y
b k d o b e c a f r u p t o f t h l a t t u c
f m o v e r s t r a A g a t t h i s p a b i l i t y t i t
t g t n o t t h a t t h e p a t e n t v i t a l c a p a c i t y a n d
a b i l i t y t o c a r y o t h r l a v e t y h v e m
p o e d p o g c s s e l v t h f o u r y r s f o l l o w i n g o f
e r a t i o C r L S B u r v M D

Nel on W E and Smith L W G n l d
Ob t r u t i E m p h y m a i n I f a n t s J I d t
S L o s 1945 6 36

Acut and h n r j r a t y d t u b c s n
v h c h e c h a c t i c l i c a l m a n f s t t a n
e x p i r a t o r y t y p e f d y p a a s c t e d v t h g e r l
d e m p h y m a r n o t c o m m o n i n t h e f i r s t
y a r o f l i f e T h e t i l v a s t c n s d b l e
e t n t T h e s p a t r y b i c t i s p p l y
i n t h e d t a l o m a l l r b c h l T h a
r u l o b s t r u c t i o n t o b o t h p a t o n a d p a t n
b u t t h e d i f f i c u l t y p t n t h e m c i r m t
d i r i s t r a p p e d n t h a l o l i a d p d m
p h y s e m a T h c m k d a t n t h e d
g r o f b s t c t i o n a l l s i t e t o f t h
o b s t c t g l e s s t h a t o t l y d t h d g c
o f e m p h y s m a y b u t n t h a m c e t h r
f r e q u e n t l y a r a o f t e l e c t s i s s w i l l f m p h y
s e m A t e l c t a s t u a l l y f l w t h m p h y m a
h n o b t r u c t n i s o n p l e t n d t h t r i p d a l
l a a i r k s b e a b s b d

Cases f b s t r c t e m p h y s m a h t a
l c a l c e a t u r i c o m m o n T h r e s d
r e p i r t r y a t e a d m a k d l y d r e s d p t y
x u s s c i a t e d t h u t i l a t i n f t h c c
s o y u s c l f r j r a t o n I n c n t a t t l r v g a l
o b s t i o n t h e c s u a l l y n h o a r s r s t
d r a d n o r t t t s t h m a f q t l y
a u d b l w h g C y n o d p d s i n t l i
g r o f t h e o b t r c t i T h p u i t i
h y j r n t c p t o c r l o c a l i a e t f
s o l d t n a d t h e r p a t r y m u m h c
t e n l b y a p l o n g t i o n a d s l l y r g h b
o f t h e p t r y p h a c T h m y m t b
n n m e d i u r a l e s O t h e t g m t h
d p h r g m n t o b e l a d f l a t t d t h b
f r t h e a p a t t h n s l a f t h l g t l i l
d T h m a v m s t b t l g t t h y
a s f d n i t y n l a t l l b a f
a l i c t a O n f l u s p t h r i s r t t l
e c u r s i n f t h e l d i l t l d j h r a g m
i n t t h o r s p r c t h t p a f r e i a t r y
f s t r b a f r f m u m j h l t h

m a j i t y f t h i n f n t s b e r v d h a v h a i a n a c t e
l f l m t e d c o s e u a f f t e d b y t h e u l f a m d e
l s t r o g l y s u s t c o f b n g t h e i f n t i l c o u n
t r p t f i n f l u a l (v r u s) p n e u m o n i s o r o f s o
c a l l e d p r i m a r y a t y p c a l o r l p e u m o n i a t h e
h a b e e n a v a t y f p a t h o l o g i c l c o n d i t i o n s w h i c h
h a v b e e n r j o n b l e f o d p n e a i n a s s o c i a t o n i t h
t h e b t r u c t e m p h y e m a

C a s e h i s t o r y a l l s t r a t i n g c n d i t i o n s i n w h c h
o b s t r u c t i v e e m p h y s e m i s a n i m p o r t a n t f e a t u e a e
p r e n t d T h e i l u d a s p t i o n o f l r g a m o u n t
o f a m i o t c f l u d a n d i t c o t e n t d u i n o r j u s t
p r i o r t d e l e r y r e s p a t o r y i s e c t i o n s o c i a t e d
w i t h c y s t i c f b r s o f t h e p a n e a s c u t e b r o n h i l
t i (i n t r s t l p n u m o n i a) a t y p i c a l f o r m s o f a c u t e
t a c h e o b r c h t i a p i r a t i o n o f z e s t e r a t e p o d e r
a n d c h o n i c p a s s e v c o n g e t i n s e c o n d a r y t o a c n
g n i t a l c a d i a c l e s o n I n t h e f a t a l a s e t h e g r o s
a n d m c o s c o p i c e x a m n a t o n o f t h e l u n a e d e
s c r i b d

W h e l a r g e q u a n t i t e s o f a m t i f l u i d a n d i t s
c n t e n t s a e p i r a t e d i t o t h e l n g b r o n c h o s c o p c
a s p t i n w l l b e h e l p f u l n c l r g t h t r c h e a n d
l a r g e r b r o c h i o r i t a t c h e a l a p i r t i n b y m e a n s
o f a c a t h t r p s s d t h r o u g h a l a r g c c p e m a y b
p e f a b l e O y g n w i t h c a b o n d i d e a d d e d e a c h
h u t c n t c t h d r y n g f l e c t o f t h e o x y g e n i
n e d d I n c s e o f a c u t l a r y g o t r a h o b r o n c h i t s
b o h o c o p e i t r t a h e a l a p i r a t n i s i l
c a t d T h m a j o r t y f i n f a n t v t a c u t b r o n c h
l i t s h o w l a c k o f f a b l e r s p n s e t t h e s u l
f o a m d f n e c a r m M D

Rob t J E H Tubb O S n d B t e M
P l u r a l a c d P u l m o n a r y S u p p u a t i n T r t d
w i t h P n i c i l l i n L a l d 1945 48 39

P n i c i l l n a p p e s t o l o w e t h e n c d e o f f e
t i n c a s e s o f t a m a t c h e m o t h a h u c h i s
a c o r d n c w t h t h f i n d s o f t h r n v e s t i g t r
T l e c a e o f c u t f v o g n m p y n
t r a t d l c a l l y t h p e n c i l l i S t l t o i s u a l l y
b t i d a d l y b u t a p a t o a n d i t a p l r l
i j e c t n o f p e n c i l l i e c l t s m u h p l u r a l
t h c k i g t h a t o p r a t e t m t s r e q u i d a
n a t h c k p u s i r m s E u a t i f l f i b r i n n d
s u b s e q u t n r f f t h o u d m y p v s t
f a c t o r y i n s m e c a s b u t t h e m t u n f o r m l y g o o d
e u l t s i l l p o b l y b e o b t a n d b y f r i a g e I n t a
p l u a l c l n i l l c l e a l y p l y i t s m o t i m p o t a t
o f c e s d g o d a t e a r l y s t a g w h n t h e
f l d s s t l l t h a n d l o c l a t n h a n t c c u r d
T h s i p l s p a t e l a l y t o t h s e c a s f s t r p t o
c a l g n t h a t i l l c t v e p o c f o c o s
e s j c l l y n c h l d t h a g d

I n t r a p l e u a l p e c l n i n a v l a b l a g t i n e r a d
c a t n g c d a y i f e c t o f m t u b e r u l o u p l u r l
f l s o n s

O t h e r l c a l c l l c t s n o f i t h e h s t g
t h i m p l i c a t n g t h r a c p l a t y m y b e p e r m a
t l y s t l u z d b y p e n c i l l n
T h s t m i c a d n t t n f f l i n c a s e s
f i l m n a r y s p p r a t q u a s m u h f t h r

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Daniel R A Jr and H lb ook T J Th Pr n
tl n of Staphylococ us Inf ct on of th P ri
to m S g y 945 7 39

Because of th diffi lties f evaluat ng th effect
of bacte iostat c ag nts h char mplant d in c n
tami ated vou ds a d bec se org nisms tro
duc d i to w nds of th kin and subcuta eous t
su i t oduced th ough needl nto the sub
c ta us tis cs g vers to w d ly vary g lesi ns
n d ffe ent nimal D iel a d H lb ook b l eved
that the p oblem c l l b stud ed to ad a t ge by
c eat ng ce ral z d and mostly lethal fecti ns of
the seous c tes of num ls As n rec t peri
ments h re n the local effect f sulfa l mude l
fath le a d sulfad a i e upo th p event n of
i fect n f th pleu l cavit s of d gs test d
follow ng co t m tion with the hemolytic staphy
loccus u us thes inv t gat impla t d th
sam rga sm ith n th perit e lca t s of d g
a d i tr duc d bacteriostatic age t immed at ly
th east r

In dogs whch var d w d ly in eight th ome
tum wa compl tely depr d f ts bl d pply a d
su p ns on f h molyt c st phyl oc us a
i c n orm ls l e solut o wa njected mong
the lops of test e Wh a drug was u d it a
i troduc d mm liat ly after the orga sms w
i j cted

The ff ts f sulfonamides in p eventi g f t l
staphylococcus ure s p to tis n dog ted
s rpre i smuch as sulf thia ole w s les ffecti e
than sulfa lamido o sulfadiaz ne Th d metri
cally opp ed to the findi gs n empyema of dogs

Total g ne lized pe iton tis occur d most fr
qu ntly i th g o p of a mals treat d with sulfa
th a ole a d least fr q e tly in thos tre ted w th
sulf ilamide The low st m tly ate i a y
group m e ver oc rrd in nimal t e t d by
mea f s lfa lam d g n by m uth add t
to local application f the drug

S EPHEN A ZIEMAN M D

GASTROINTESTINAL TRACT

Vld b k A Solit ry nd Multipl Ca cin m f
th Uppe Alimentary Tra t f i d f
Stockh 944 5 330

I the t cl e years f o i 93 t 942 th r w e
s en and treated at th Rad m C nte i C pe
hagen r 3 3 pat t th ca c f the pp r l
ments i tr ct that f th l p th m co m m
br c f the r lca ty d th t gu th t l
l a r g n th mes ph n l h j x h a r n l
th es ph gu d d g th ca d i this co
t n the mesopharynx nd h poph ry are nd r
stod compr ng th ba f th tongu th p

gl tti (both ts ventr l a d d al s rfa e and its
f ee m g) th epiglott c valleculae the aryep
glottic f l l the p nform ccesses and the a yt noid
and postc icoid regi n b ides the late l and po
te ior walls f the m sopharyn and hypoph ry n

The s te of these cancers thus comp ies a reg n
e te ding f om the apertu e f the mouth to and
incl d g th card a a eg n which phy iolog cally
may be con id ed as a wh le since the cavities
ch efly s ve for the passag of the f od particl s be
fo they e s bj cted in the stom ch to mor
le gthyp c c of digestion They a at m cally pr
sent un fo mty nssofar as that th mucous mem
br e th o gho t co sists of e e al layers of a
nonk at i z i g sq am u c l l eplithium The only
e cept n t this a e the l p hich are co cr d with
a mod fied mucou memb a e and i hich p haps d
not st ctly speaking form p t f the alimentary
tract Th rea n fo clud ng th m i the fi ld f
the invest gat on s the s milarity of tract e of ca
cin mas f the l p and ca c n mas of the o al cavity

A ve of the mate ial h w s that th m t f
q ent i l cance f th upper l ment v tract n
the st e se s th es phagus C nctr of th
esophagus s th ee to four times a frequent in men
as in women In both s es the l cation i n th
t athoracic portion i ab ut 85 pe c nt of the
cases In the c rical p t n f the esophagus th e
i a cha acte stic diffe ence n r ga d to the occur
ce of ca cer n the two s s In omen th tum
s most fr qu ntly i ated at the nt a ce to or in
the n ck p r f the tube i men th locat on is pr
d m n tely in the j gulum

In w men the t m rs ccu chi fly in the post
c i l d eg th poste ior v ll of the pharynx
the ent nce t th es ph gu and th cerv cal p
to of the l tte in men th y occur mostly in the
lowe l p the base of the t ngue the p niform s nus
and the part of th esophagus f m and includi g the
jugulum d vn to the bifurcat on In other reg ons
th e s no d monst abl d f f r c in the relat ve
f eq ency of the tumor in the two sexes

Mcro c pically the tum rs are of d fferent types
No e of th m is rel tely m re frequent in o e s x
than in th other The diff enc depe ds o ly n
the locat on of the gr w th

Accord ng t both cl cal and e perimental e pe
ri ce t eem pr b le that th d e ceurs as the
es l t f a c mb ed act o of i t l fact rs — the
p d position—a d d rs gen us f ct rs—such
as t l laco a l e hol lues de tal car es lveol r p v
r h nd l dlv ftt g de tal p osth ses In the
uth s mat al lues was f a t ul l y f que t n
the an mnes s of pati t w th l p ca er (9 5 pe
nt) a d carc in m f th t ngu (2 8 pe c t)
lles f q t in th a am esis f pate ts w th
c c ma f th h poph ry nx and of the esophagu
(3 6 pe c nt)

pal fistulas or abscesses associated with diarrheal abdominal distention vague lower abdominal pain or uneplained fever. The mechanism is chronic or intermittent diarrhea associated with abdominal pain of the peristaltic type. The exam may be dull to moderately severe lower abdominal pain associated with diarrhea, boggy mass with or without a palpable mass or a low-grade fever. Finally there may be symptoms of chronic recurrent or acute intestinal obstruction.

meal study of the small intestine together with a barium enema usually lead to the correct diagnosis. This should be done in the cases of all patients except those who have definite biliary obstruction or those with symptomatic gallstones. In the presence of a chronic catarrh of the small intestine, investigation of the small intestine has usually been inadequate. The interpretation of an erroneous diagnosis is incapable of howing some type of congenital defect of the intestine. Finally, of which would require a separate study.

There is considerable controversy in the etiology. We do not know whether the causative agent is an organism or a virus or an animal parasite. The primary attack is unknown, but it is generally thought to be by a fly, the tsetse or the tsetse fly, the blood sucker, but the lymphatic system is usually thought to be involved in a direct or indirect fashion. If a cellular infiltration of the tissues is observed, as pronounced thickening of the lymphatic hyperplasia and obstructive lymphedema. The lymph nodes exhibit the same changes but the content of mucopolysaccharide is not as pronounced as in the involvement of the lymphatics.

Th a th had o p t i s o n h m g cal
th apy was u ed l l e n f th e s h d t e m al
l t 3 had r g al leutis (not t m n l) a d 5
had le ol t i f u f these p t e n t s d d a d 5
su i e d I n t h 15 s r v o r s t h e v 9
r e c e s o g o o d r u l t e r o b t n e d 37 p r t
W h t h e s u r g c a l u l t s a r c o m p a r d t h t h
e s t s f l l i g o t h t h a p t i c p r d t h e
c d n m a y b e t h d t h a t 3 f t h p t n t s
w o l d h e s u c c u m b e d w t h o u t u g r v a s m p r d
t h t h e d a t h f 1 f o l l i g o p e r a t I 7 t h e
c a s e s t i s m o s t i l k e l y t h t m o e f a r a b l s u l t s
u l d h a v e b b t a d t h c n r v t m a n
a g m e t n a e o f t h e t e t f t h i l m e n t
n d t h p r e s c f f i t u l a s n d t h a b m l t e
C n s q e t l v n y c t i a o f t h 9 o p a t n t s
w o u l d c t a l h b e b t t f l h d u r g y
n o t b n d e T h l e a e s o p a t t s h o m t h
r e s l t s t o b a t e p a t d l v c o r v t m a g
m t e a t b e s t m a t d B u t t w o b t f l f l l
o p t n t s o l d h a v e m i d w l a s 7 f t h e m
h e b e f l l g r e s e c t o f t h l e s t

of radical surgery is essential in the treatment of the disease. The results of the operation are usually good, but the patient must be kept under close observation for some time after the operation.

mesentery ever recede during the course of adequate medical management. It is possible in some instances that recession of the lesion may occur but concurrence with the disease up to this time would suggest that complete resolution rarely takes place. However, even though operation is deemed impossible adequate medical management should be continued indefinitely as clinical improvement in an occasional patient may be nothing less than remarkable following a relatively short period of hospitalization and thoroughly adequate management.

SAMUEL J FOG LSON M D

Frimann Dahl J On Strangulating Ob struct n
of the Small Bow l with Spe ial R f fence t
Ca with P r Roentg n Finding Act
ad l St kh 944 5 48

Mo t a t b o s a g r t h a t t h o e t g e n e x a m i n a t i o
f n s h e s v a l u a b l i n f m a t n a s t o t h e t y p e f i l e
l o c a t i o n o f t h o b s t u c t n a d i n m a y c a s e s e v n
t h c h a c t r o f t h e s t e n s i s

F practical purposes tw kinds of ile s may be distinguished p s s mple bstrction on f the bow l by adhe ns p s s e f om out de or a pathologic process ithn the gut and () st angulati g il u u ually cau d by ba ds wh ch f e q ntly con tr ct two segm ts of intestine A st angulati g il us is usually caused by bands co tract g tv segm nts f the gut th carceration of a pt f th mes ntery Iru trngulati ns nearly always i vol e only th sm ll int t n Th sit of the ob trction lies most f e q ntly i th lo er il um and n equ ly th bstrctio i u ually locat i in the right lo e pt f the abd men A simpl obstruction dev lops rel ti ly slowly w th lck attacks wh tra gulat n dev lops qu ker th p ns e mo v le t and mor c stant and th p t is mo exhausted In the first the testinal mov m t is a e dist ct i e in the latt r th per t l l has be ed c d h s complet ly cea d th e t re p t p oint to ar d p e i n t s

The question arises whether both types of ile can be distinguished retrologically. The answer to this question is the following: 28 cases of malabsorption of amino acids were 32 cases of strangulation and 2 gave inconclusive or poor results in the tests. The latter clear and definite results in the cases may have been due to the fact that the patients also had air. Also gas was probably not entering the pectens because of the gut finally an antiperistaltic movement could have repelled the gas.

In pate ts v th an acut bd m nal co d to n
 whom x a f l g demon t at clear gas and flu
 l els the f ilo i f g d mps just f su picion f
 r regulati n il u (a) an bn mally mail am nt
 f gas n the col du t th fact that the ntest nes
 d tal f th t nos s a shru k n nd co tr ct ed
 (b) a tum lik h f w u ally n th r ght lower
 abd me f r v g c ula in sh pe nd well
 cum cr bed w th ut th h r ppe uph l c n
 t r f a cv t a l (c) pel c ud t

f th kn r ben ath I ve f th se n n had
ab cesses in the abd minal w ll ith pa tal rc m
pl t e jarat o: f th abd n lic n Two
develop d subphren cal scesses (b lat als sc)
and r pat nt present d an cerati The pera
tive notes occ sionally menti n d the fact that ten
s on was cessa y to e t rioriz th b el

I the f t place mobilizat on f th la ge b w l
by divi on f its lat l pr t n l attachm nts is a
relatively avasc lar y r c due Th only bl d v s
s is wh ch m y need to be cl mped a d divided are
a f at the spl nic and hepatic fl xus Th retro
pe ito als co d portion of the du denum will be
nc nter d the right s d n l s l d b care
fully r flect d p t rily Th te n the side
nv l ed hould of c urse b fou d d pr served
An ex l lent gud to th uret th p matic
v s l c r s i g ante to th u c t r d tly bel
the kid y plvisanily justit alt t th ough
o t t s co r s c d t the pl I t i ation
of the ple c fle the jejun m t t i g ment
Tr tz ill ofte b c pos d a d i j ry t t sh ld
b avoid d Th m nte y of th lon ll b me
r th r th n d d licate as it c ffect d f om the
po t r abd minal w l l a d e m t b tak n l t
it be per rat d by the r act g fingers A v per
f ratio sh ld of course b clo d to i v t
pos sible b r n ation of the sm ll b el th gh the
ap t e Littl f a y d s s c t n lly nce
ssary l b ation f th gmo d ol The
amo nt of d s c t on c s s y th wou d f the
tra v se l dcp d s l g ly nts du l t cy
The me tum has n a c l attahm t t t
t a s r c lo nd ca b ily mo d L n
th n c ary l b at of both fl ure ho l d not
prolo g th op at p d r und ly i m t
cases a d th d q te e po ure that i es n
tial n the c p t n t t ho l d add but fi t n
minutes to th p t i g t m

I the c d pl ce ad q t mobiliat f th
be l p m t th rap d format of f o s v
n h d ul l b r r l d c l s t m s y r Th tu
mak t j b l to t m t t l t n t y at
a lat r d te by r trap ito l p c dur
Two r v of sut c unt th t o l p facilat
the subs qu nt clamp g of th p t t on The
tures sh ll ot b p c d t th l m n f th
bowel The i ot f th tu h a d
app mati n all th t i qu d Untig th
l n tu d l b a d s of th c l by u l
t u e s t e d i thout c t c t f th t u p
m t the f mat n f a d ubl b l d l t y
b ch n l e n add l r k i p t t a d
h ch l l f r m th p n t f i f th l t e r
rest at o f t e t al cont nuty A h r
h j u t o l y p r m t th c l t y t m t
beb ught ll (to hes) bo th k l l
but al r s an ad q t w bo l l m f r th
s b s quent c r l l r w b b p o t j t i
l a l a g f n t e s t a l c t t f th p u s m d f
f c c n t l g th th f r s t l a f i th b e l l
l d s f n tly pl ble by m a l f l l ca

t i su t th t me f clous so that it can be n
v t e l i th t t e n i N c m pl cat ons occur ed
wh ch c l l l attr buted to the clamp ng
clous a d d there has b n no mortal ty among the
pati nts v th p r f rated colons On patient had
leakage of i testu al cont nt postoperatively th s
as prob bly d e t the combun tion of a short
spur plus the f mat n of an abscess postopera
tively in the old s nus t act made by th shrapnel
fra m t which commu cated with the vou d of
clous e (Those pat ents whose colostomy s i e e
closed w e return d to Class B duty)

The i denc of nfect on n the e ou ds was
h gh b cau they we open i ou d in the col
freque tly a sociat d th g oss soil g of the per
stone l cavity by f cal m t e al Because of this
f c t s me su g s bel ve that complete closure of
the l pa otomy incision v ith ext i at n of the
bowel thr ough a late al stab wou d d creases the
i c denc of f c t on and separat o In the o g i al
c s ons th small series the ncid nce of nfect
tion was eq al (5 p e cent) i the g p with the
stab wou d c lostomy nd n th group th the
col t my in the l pa ot m y incisi n

Th tremendous m unt f support ve t eatment
nec sary to carry th se p tients ver each of thei
c m pl cations has not be n m nt ned but can
adly b m g ed The tech cal t eatm t of
ma y f th r complication s is usually n t d f c l t
b t th d agn s s often e cced ngly d f fult
The pat nts hav all be n th ough so much that their
m a g n o s f e t y is small a d one m t b constantly
n th a l e t t d t c t even slght ch ng s in the
g n l c d t o A slght le t u n a t mpera
tu c rve h ch has been fallng m y and at a
ab ce s h ch must b f und a d dra n l
q ickly f it may be just the taw which b e k s
the camel s back

JOHN E. KILPATRICK, M.D.

K y s E L J Th S n t i n f Ga Stopp ge
d r i g t h O t of A ut Appe d c i t i s S
x 7 945 7 7

Most su g ns in p act ce del y th diagnos s f
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The onset f append c i t i s mea s the first hours of
vague bd minal d s c m f t p i o to l cal zat n
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ppendi I t a sustained colic wh ch ca seldom
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or bow l mo ment

The n t o n i gas s t p pag al y a des t
pa s gas downwa d r ther than up a d i t ha c
t r i t cally r l ed i t i l f at all by wh t ga es
feces wh ch j It is th ubj ctiv en t n (a

of the drainage of the peritoneum and abdominal wall were bandaged. There was no perceptible change in the number of abdominal abscesses or in general edema or tonus. The use of silk suture material reduced the number of wound infections appreciably. Wounds closed with silk which came infected drained approximately 5 percent less than similar infected wounds which were closed with catgut was used.

By 1912 the technique which had evolved at the clinic employed the McBurney incision and the use of silk (nylon suture) suture material and the use of sulfoamide drugs. The results in the last 300 cases have been most satisfactory. In the remaining mortality (3 percent) and secondarily the edema, the number and severity of infectious complications. There was a low incidence in the number and variety of intra-abdominal abscesses. The use of sulfoamide drugs and the no drainage technique are emphasized while it is believed that the choice of suture material plays a lesser role in the results.

JOHN L. L. DQ MD

LIVER GALL BLADDER PANCREAS AND SPLEEN

Ba hhuber C A D B P II and Fyl R F A
Gangren a d P f at n f th Gall Bl dd
Am J S g 945 67 4

In a review of the literature on the gallbladder, the two fundamental clinical reports advocated amply the types of therapy. Similarly, the surgical procedure suggested the different types of pathological lesions. The results of the surgical treatment of the gallbladder and the results of the treatment of the gallbladder rates that prompt the study of the gallbladder and the results of the treatment of the gallbladder.

In the period between January 1913 and January 1914, 699 patients were admitted to the Angel's County General Hospital during the attack of bilious tract disease. Of these, 34 percent were followed up. Eight hundred and twenty-five patients were followed up. Of these, 52 percent were followed up.

Of the total number of patients, 115 (6.76 percent) were followed up. Of these, 115 (6.76 percent) were followed up. Of these, 115 (6.76 percent) were followed up. Of these, 115 (6.76 percent) were followed up.

When the ulcerative process was meted, the incidence of gangrene and perforation was noted. The number of cases was 56.8 percent. There were 56.8 percent of the cases. There were 56.8 percent of the cases.

In the period of the medical service and operative and 8 percent of the deaths on the surgical service a total of 47 deaths or a overall mortality of 2.76 percent. Of these, 38 were operative. This group made up 8.85 percent of the total mortality. A total of 47 deaths or a overall mortality of 2.76 percent.

The comparative incidence of the gangrene and perforation was rather high but not nearly so high as some of the statistics quoted from the literature. In the fair series in the literature, the conclusion is that the number of acute attacks each patient in the series experienced should be taken into account. The mortality of the gallbladder. If the average attack per individual was placed at 2, this would mean that the average attack of the gallbladder was 5 percent. Although no exact figures can be given, it is the author's opinion that the average attack per patient before surgery is probably above the average of the gallbladder. The average attack per patient before surgery is probably above the average of the gallbladder.

By the time the mortality of the gallbladder is taken into account, the mortality of the gallbladder is taken into account. The mortality of the gallbladder is taken into account. The mortality of the gallbladder is taken into account.

If the mortality of the gallbladder is taken into account, the mortality of the gallbladder is taken into account. The mortality of the gallbladder is taken into account. The mortality of the gallbladder is taken into account.

The mortality of the gallbladder is taken into account. The mortality of the gallbladder is taken into account. The mortality of the gallbladder is taken into account. The mortality of the gallbladder is taken into account.

J. L. KIRKPATRICK MD

MISCELLANEOUS

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GYNECOLOGY

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t n consi ts f l i g h t l y c u r v d g l a s s f r e t t o
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c t e t h v l a l c h o l d t h)

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The pa n is de b d as a d ll ach i the pel orse he th pate t is stand a d r liev d when she s recumb nt Th may be als m o rhag l ysp reu na e k ess ne u back che lu rhe a nd dysme rhe a

The co rect d ag m y be mad by ly ing the patient s ympt m and fr m th p l v i c f i d g Onp l v c am atio n m y f i d b l a t r a l ad ne al te der s w th s f t doughy re st c non orb th ad ne b t v thout the p nce f a defi t m a s Th d ughy r sta n the ad a m y b more ma ked if th pate t ise am l n th Fo ler p t n o wh n sta d ng Th ympt m and d s b l i t f th patient e t of pr p t o n to hat could pect to f i d on pel c am i at

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H F THU M D

M t n D G P l v i L y m p h a d n t m y I n t h T r e t m t of Cervical Cancer 4 m J O b t 945 49 9

If the pr m s i b h c h T u g b s d h s o p r a t o n a n e l y , t h a t m t a s t a s e s l y m p h d e s a r p e c u l a r l y r e s t a n t t r a d t n c a b e s u b s t a t e d t h n h s p o c d d v e s a m u c h m o r e e t e n d l t r l I f h o w v r t c a b e s h o w n t h a t m d n x a d t i m a y a c t u a l l y d e s t o v m t a s t t c c a n e n l y m p h n d e s t h n t h s p t a n d p o s s i b l y m r c o m p r b e m e t h d m y p o e p e r T h n m b o f c a s s o f a r s b j t d t o t h p r o c e e d o f l y m p h a d e n t m y i s i n s u f f i c i n t t o d t r u e d i t l v i t s p h f s f u l e s s i t h t r e a t m t f c r v c a l c a c e T h d i s t t l y l o w e n c d e n c e f g l a l u l r i o l e m n t t h a u t h o r s s w h e n t h e o p e r a t o w s c a r r i e d t a f t e r x r a d i a t n s g g e s t t h t m o d r n r o e n t g e n t e c h n i q u e s m a y m k e l y m p h d e c t o m y e s r v C e r t h t h e l t c l l f r a t e f p e r i c a u b j c t d t p r e p r a t v e r a d a t n c i t l t h w h h i c o p e t

rad at on has been employed as th s appears to be the cru of the wh le matter

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EDWARD L C M D

MISCELLANEOUS

F d S C The T a t m n t o f P r m n s t r u a l D i s t e w i t h S p e c i l C n i d r a t i o n o f t h A n d g n s J A m M A 945 7 377

Relatively l t t l a t t e n t i n h a b e e p i l b y m s t p h y s i a t o t h d s t e s s t h a t m n y o m n u d e r e d u r i n g t h p m e t r u l p e o d h i c h u s u a l l y d a p p e a r s i t h o t o f m e n s T h d t u r b a n c a t t h t m e f t h o v a c y c l e h a b e c t e r m e d p m e n s t r a l t e n s i n T h s y m p t m s a s i g a n e d c h a r a c t e r n d i n t e n s i t y a n l c u r i v o s c m b t i t h e m o t c m m n c m p l n t s b e g n e r v o u s s s t b l t y d e p r e o m o t i a l i n s t a b i l i t y h d a c h e n a u s a a n d a f e e l i n g o f t e n s e e T h m o s t c m m s i g s a b l a t g f t h a b d o m n a l b e u t n u s d m

G r n h l l a d F r d m i n t m e d t h t h e r e t e t i n f s d u m b y t h e t s s u s d u c d b y t h e s e s t r d s o p e r a t i n g d i n g t h p m n s t r u a l p h a e s r p n s b l e T h s r t n t n f s d i u m i s a s s o c i a t e d w t h a n i c a s n t r a l l l r f l u d s o t h a t t h s v e l l i n g f t h v a r o u t u e g s r i t o t h e r e s p e t i s y m p t o m s

TABLE I—TREATMENT OF PREMENSTRUAL DISTRESS WITH TESTOSTERONE PROPIONATF

N m b e r	N m b e r	S e v e r e S y m p t o m s	
		B e f r e T r e t m	A f T r e t m
	5	++	3 +
		+++	++
			5 +
			5
5		++++	++++
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OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Am II R F A Tl p uti R gim n f Ecl mp-
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I A L C r MD

H b r C P Tl Tal f tl C n vative
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U v r s ty M d cal Center I d napol Th e
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of May d Ju Only 9 of th 51 p t nt had had
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n t for the f t m E ghty four p r c e t of th
pat nts er under thirty y e s of age

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35 p c t These esults are s p o r that a furt l er
naly s f th m s mpe t e

Of th 14 p t nts v h o d velop l cl mps aft r
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occ ed i th s group

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t l v e c l m p a w r f l s s th n th r t s
k l u t o n i n all but i n s t e the f tal heart
b t present f m t u r s a f t d m n I r
tu t as t an mpo tant f c t r i this gr up
f f t d ath and the y ca be looked up w th
ut d i t n al x e p t o as d e t the t emia

The drug is well tolerated by the infant's eye. Occasionally a mild transitory flushing of the conjunctiva is observed. DANIEL G. MORLEY, M.D.

MISCELLANEOUS

Ba t n M W l k e r K and W i n B P A r t i
f i c i a l I n s e m i n a t i o n B t M J 945 4

The authors give an excellent resume of artificial insemination, sterility, procreation. In cases of male impotence, dyspareunia, ejaculatory failure, a defective cervical vasectomy, a tubal ligation, or a tubal ligation with the husband's semen is possible. The technique of self-insemination by the wife is described. A disadvantage when the first three of the conditions is present.

Artificial insemination, the donor's semen may be used in cases of curable male sterility and for genetic reasons.

The procedure of artificial insemination with the husband's semen is described. The problems of choice of cycle, duration of method of cervical stimulation, selection of semen donors and the organization of artificial insemination with donor semen are discussed.

The following potent dangers of artificial insemination are mentioned: uterine infection, a delayed genetic conceptus from defective semen, and procreation.

H. A. V. F. L. S. M. D.

O S u i l l a n J V and B o n L B E m p l y m e n t
of the P r e t n t a l W o m e n B t M J 945
85

The authors follow up 30 patients for a long as seven months after delivery. Many of the conditions followed by the patient's behavior changes, a decrease in the

Very few of these mothers felt that the delivery of the child was a great thing. Most of them felt that the delivery of the child was a great thing.

rk

In cases of fetal death or financial stress, the mother's self-medication and an attempt to turn to work. The authors concluded that normal looking mothers should not consider returning to work until six months after delivery. HARRIS, FIELDS, M.D.

M Donough J F V a g i n a l B l e e d i n g f r o m P o t a s s i u m P e r m a n g a n a t e U s e d a s a n A b o r t i f a c i a n t V E g l a n d J M 945 3 89

Sixty-five cases of vaginal bleeding resulting from the insertion of potassium permanganate as an abortifacient were reported from the Boston City Hospital. In all cases the admitting diagnosis was threatened abortion, not the patient gave an accurate history. Upon further questioning, all patients admitted to the use of potassium permanganate as an abortifacient. Only six were successful in producing an abortion.

The ages varied from eighteen to thirty-eight years. Fifty-three patients were multiparas, 38 of them having been delivered of living babies during the past year. The majority of women had mild or no symptoms.

The chief symptom was vaginal bleeding, occurring within two hours after the insertion of the tablet. Twelve cases required treatment with shock, 10 required sutures under anesthesia, 1 the operation, 1 a medical abortion, 34 simply required vaginal packing.

The typical picture of a fecal examination revealed a normal, reddish, or blackish color, usually found in the postpartum or in the vaginal both the cervix and the vaginal mucosa. The cervix also appeared to be severely irritated or to present a carcinoma. The blood was found in the maternal blood to be a bright red pulp, at first.

Because of the gradually increasing frequency of this new type of abortion, it is a different kind of diagnosis of cases of abortion, long the child bearing age. A word of caution may be ultimately of some of the pregnant cases.

C. I. B. H. M. D.



Fig. 1. The leg from the side. The knee joint is shown in the center. The foot is at the bottom, and the thigh is at the top.



Fig. 2. The leg from the front. The knee joint is shown in the center. The foot is at the bottom, and the thigh is at the top.

When the leg is fully flexed, the knee joint is in a position of maximum flexion. The femur is in a position of maximum flexion, and the tibia is in a position of maximum flexion. The knee joint is in a position of maximum flexion, and the femur is in a position of maximum flexion.

On the other hand, when the leg is fully extended, the knee joint is in a position of maximum extension. The femur is in a position of maximum extension, and the tibia is in a position of maximum extension. The knee joint is in a position of maximum extension, and the femur is in a position of maximum extension.

The leg is in a position of maximum flexion when the knee joint is in a position of maximum flexion. The femur is in a position of maximum flexion, and the tibia is in a position of maximum flexion. The knee joint is in a position of maximum flexion, and the femur is in a position of maximum flexion.

attacks last from a day to a fortnight, usually subile. They are usually brought on by excessive use. At the time of the attack, the bony part of the leg is lifted easily out of its bed. The character of the approach depends on the position of the leg as revealed by the lateral roentgenogram and may be either anterior or posterior.

The femur is all the same length, which has been observed best in the frontal projection of the elbow. Here we see according to the degree of separation a hardly defined circular or oval button of bone which is found in the center of the normal distal end of the femur. The lateral projection of the femur shows the thickness of the shaft and the contour of the distal end. When separated, the femur is placed in a position of maximum flexion, and the tibia is in a position of maximum flexion. The knee joint is in a position of maximum flexion, and the femur is in a position of maximum flexion.

In all the cases of the femur, the femur is in a position of maximum flexion, and the tibia is in a position of maximum flexion. The knee joint is in a position of maximum flexion, and the femur is in a position of maximum flexion.

These femurs are separated from the tibia by a space of about 1 cm. The femur is in a position of maximum flexion, and the tibia is in a position of maximum flexion. The knee joint is in a position of maximum flexion, and the femur is in a position of maximum flexion.

In some of the cases, the femur is in a position of maximum flexion, and the tibia is in a position of maximum flexion. The knee joint is in a position of maximum flexion, and the femur is in a position of maximum flexion. The femur is in a position of maximum flexion, and the tibia is in a position of maximum flexion.

may result the patient has to be protected from further injury
it may cause epiphyseal arrest and malignancy may
develop in cystic lesion which have been treated by
heavy irradiation D H L M M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

W B T G V T m n t I T n d n s in Finger
Amputations and Description of a New In-
strument S g y 945 7

Disposition of the tendons in finger amputations is a matter which the surgeon must satisfy of
himself. The techniques of most published works
operating surgery recommends the following method of
the tendons to the tenon sheath to the bone
in order to preserve the great stiffness of the
fingers.

Kirk advocates the following procedure for meta-
carphalangeal disarticulation.

The finger is hyperextended and the tendons
cut and allowed to retract in the sheaths. The
finger is flexed the joint is disarticulated and the
small sharp bladed knife the joint is opened the
capsular ligament cut and the finger re-
moved.

This hyperextension of the finger which allows
the tendons to retract in the sheath gives
a very useful handle. After the amputation is curet-
tized to the sheath at the point of disarticulation
the tendons are sutured to the flexor or the
tenon of the end of the metacarpal stump pro-

duces an unusual type of disability with loss of the
grasp and inability to flex the fingers into a tight fist.

The mechanism of this disability is interesting and
is related to the common origin of the flexors par-
ticularly the profundus group so that tension on
any one tendon restricts partially the excursion of
the others. This is best demonstrated in the normal
hand by holding one's middle finger straight in a line
with the metacarpals then trying to close the other
fingers into a tight fist. The fingers cannot be com-
pletely closed and there is pain in the forearm and
hand as this is attempted.

It is better practice to allow the tendons to retract
within the sheath so that they are densely adherent as
from an old injury both the profundus and superficialis
should be stripped out to allow free motion. Control
of the proximal phalanx is exercised through the
digital tensor complex. Essentially this is the tensor
complex composed of fibrous bands and interosseous
as a flexor of the proximal phalanx when it passes
ulward beyond the middle of the flexor is of
the metacarpophalangeal joint. The interos-
seous carry the great load; the motions are very
strong and give an excellent grip.

Disarticulations at the distal interphalangeal
joint amputations in the middle phalanx are best
treated by dividing the flexor profundus tendon
allowing it to retract.

Amputations in the terminal phalanx rarely
occur and division of the flexor digitorum profundus
tendon into the buttock base of the terminal
phalanx the tendon attachment is lost.

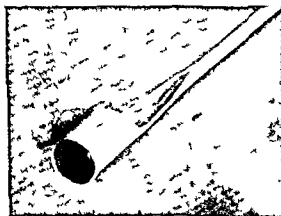
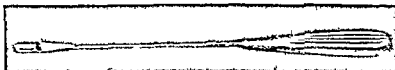


Fig. 1. The thumb when the tendon is
released as a functional unit. Close up of
the tip of the thumb.

tact R attachm nt f th e l f p f d
 ti h l i b c i d t f u l i h c
 cu ed
 E t i s e r t d l n t t c t p i r b l y d
 i f f i t a l l b d h t t t h d e r l y g
 b e a n d f u c t q t e l l h f r s e t h r e
 s p r o b l m f m y t j h t h a t h e t h m b
 t d o n s h o u l d b e p d d u t u r e i t t h b o n e
 v t h t s a l y n o m l a p s s b l e

In o n t m t d o r f e c t e d s s e s t h t e n d o n
 e d s h o u l d b e a c h r l a t t h p o n t o f a m p u t a t i o n
 a d t h t e d n h t h l f t p n t o a v o i d s p r a d f
 i n f e c t o n t o t h h n d S u c h t e n d o n s m a y b c o m e
 a d h n t a d p d u c e d s a b i l i t y T h e y s h u l d b e
 e d t o f t h f i n g e r t h t c m c l e s i f t h e
 h a n d b e i n g r l i d u p o n f o r m o t o n o f t h t m p A
 t n d n s t r i p p e r s u i t a b l e f o f e e i g s u c h t n d o s i
 t h h n d d e c b d

The r e m i f d s l y a d h e r e n t t e n d o f o m
 t c a r r d b e d u l d r q t s i v e i c o n s i
 t h h n d i f n e s o u g h t a d q t e p s s e o f i t s
 e t r e l e n g t h E c s o n t h o g h s m a l t r a s e r s e
 i s i n t h e h a d d r s t c a b c a r e d o u t
 c l y w t h s m o o t h t n d n s w h c h s t p a i s y f r o m
 n r m a l s u n d g t i s A a d h t t d o n
 m u t b f r e e d d a r n g l i k e t p p e r h a b e n d e
 s g n d t h a l o t h n h a n d l t d s s e c t u c h a d h e
 s s a n d f r e e t h t d n i n m u h t h e s m m a n e r
 a M a s o n f a s c a t r p p e r i d t o r m o l o n g
 s t p f f a s c l a t h o g h a m l l i n c i n t h e
 t h g h T h e t n d c a n t h n b e r e d t h g h a
 s c o n d s m a l l t r r s e i c n t h e w a s t

T h s t r i p p e r d s b e d h l o e c i n f i n
 d o n a n a m p t a t o n s t u m p s f i t t e d o v t h e s
 e r e d d o f t h t e n d o a d g u d d t h g h e
 p l m o n t h e t n d n I n t h i s m c h a c s l p p g
 f t h e c t i n g d g d u g m e t m e s v g o u d i
 s n f t h a d h e s s e a o t o c u r n d i j r y t m
 p t a n t n e r v e n d e s e l n t h e p a l m s t h p
 n t d R r P M o r o o m e v M D

A n d n R C o n n t r i c A r t h o d i s f t h A n k l e
 J n t A T r a n m l l e o l a A p p r o a h J B
 S g 945 8 37

S r o s i n f c t s l a i j t a d t a u m a t a r t h
 r t m a y r q p e r a t s f f u n o f t h a k l e
 j t I h d s b l g y m p t o s o f r a m t c t h
 r t s c a n b e a d c a t d b y c c f l f n T h
 c d e r b l e d f i c u l t y i n s u l g i g t h e k l j m t
 t h g h t e t r p p h d i g s u c a l r
 s o t n f t h c a t l a g i f t h e t e j t t b t a n
 t h d i e d d e g f q u s i f m s t o d g e s
 a d l g h t l g U n a t f a c t o r y i m m o b i l t o n
 p l y a n m p r t a t l i m p o s l t s

T h i f a n m a l l i a p p h s c o m m n d d b y
 m n s f b l t r a l p p r o c h t t h e l i j t
 a f t u b p e r t l r e c t f t h m l l i T h e
 n e x t t e p i n t h p c e d e c t s r e s t n f
 c t l g a n d s b h d a l d b s o t h t t h e
 r e s l t c a l l b r f c a c o c t i
 s p e l c d t t m e c o m m d d T h
 i e r m i t s m a m u m c t a t b e t w e n t h t b d

t a l A d d t n l t b l i t y c a b g a d b y f
 t h d t a l f l i t t h t b T h m t h d
 l b l t h t c t m n t o f p p t t h t
 I n t h e p t r e t h n i a l g u l n l c
 m a d o e t h e m d l m l l s h c h i e s t c l
 u b p t a l l y A l t l n c n m d e t h
 t m l l o f w h c h e s c t d b p t l l y
 T h c a t l e d s b c h d r a l b o n e f t h t a l u s a d
 t b a r e s c t e d A e s c t n o f a v a r u l g
 d b m t y c a n b e m a d e g t h s p r o c e d A n
 a t h o d s s o f t h e a d j a c e t s r i o f t h e t b a d
 f i b l s c a r r e d o u t T h r e m a d o f t h b e f
 h m l l e o l r u d e d O t g e s s m y b
 t m u l t e d b y r a i s l t t l e b o e f l a p s a d b y i g
 b n e c h i p s A S t n m n p u n i s p l a c e d t h r h t
 d t a l t b a p p x i m t e l y s u p r o r t o t h a k l
 j n t L o c k n t s r t t a c h d t c h d o f t h p
 n d a t a p p l d f m t h t e s t b t h l n
 W t h t h r e c a t c a s t l e s t c h q u e a h h d
 g f m m b l a t s s u p p l e d i a t n t w t h
 o m p d f a c t s m a y b e c r u t c h m b l t r y
 C t l m m b l i z a t o n i b t a n d b y g t
 t f i p i t h r o g h t h e d t l t b o e t h u g h
 t h c a l c u s d n t h u g h t h e c k o f t h t l
 T h f r p u n c e c t e d t h i t n d d
 t h t a l s i s k p t n a p p o s i t i o n t h t b a

R I C H A R D J B E E T T J M D

FRACTURES AND DISLOCATIONS

S t n k W F n d P e t e r n W C C o m p o d
 F r a t u r e O c c u r r i n g i n t h A r m y F t r s
 I n f i c i n g T m n t A m J S g 94 67
 333

T h e p r e s e n t a h c r e a s d t h d c u s s f t h e
 m t h o d s o f t e a m t f c o m p n d f r a c t e s A r t
 c l e s w h i c h s e e k t p p l y c i v i l a e x p n c t o t h
 c a e f w r w d f t h i n c m p l t e d e
 s t a n d i n g o f t h f r a t e p o b l m t h A r m y f
 o d e t p o t c t r a i n f c t r s w h i c h i n f e t h
 t e t m e n t w h c m y b e g n i j u d s l d r t h
 u t h r s h a v r e v d t h m p d f a c t e e
 b y t h m n t h d f f t s l t l s T h c s e s
 b r i e f l y s t a t e d p s e n t a t f t h e g o p f m a
 p l a c e m e n t t r i n g c t e r T h r e s u l t s s h w o n l y
 w h t h a p p e d a n d d l e c c m t a n T h y
 a o f n a d j p l a n g t h c t r a t m e t f w r
 w u n d T h c o m p d f a t e e d a m o u
 t a m t r a n g t r w a s o f a d t l y d f f e t h
 a t A b o t h l f f t h e f c t c u r r e d
 d m l t d b t i l o d t n B l t i n j n e s
 r a n g i n g f r o m c m p o d f t e s f t h f i g u r e s
 u d o f t h t m t e n t y c u r r d d g t
 t m p t o i m p f d m a d g n d f m
 d y n m i t e M y f t h p a t i s t u r n d f r m
 r s a s T h e m d p o d c d b e c o m p l c a t d
 i n j n e s T h i t w s d m t n r v e s t h o t
 j u r y t c l o s l y l a t d t r u c t e s B l l t
 w l l s h l l f r a g m t s t t m s p d u c d i r g
 o u l d f e c t t h f t s d c a d y
 m j p o t f t h b o e T h t y p f c a f
 c n s d r a t o n s h o u l d b e c l a r l y d n n d b o t h a t

th c t t f j r y a d t l circumsta of its
c nee

th j t t a c t t e l i accorl th j
c i f c i s t r u c t f r m t h o f f c e f t h e S u r g e n G e n
r l l h e s i n c l u d a l q u a t e e p u e i t h c a r t o
a v o l e r c a f t h s k i n a n f r e m l o f r l i l y
a c c e s i b l f r e i g n b o l e s p r u c t s o f b e s p a r a d
f r m t h p i t u m a n d e t a l e l t T i g h t
p a c k i n g f t h e o u d t o b a v i d e d F r a c t u r e s f
t h e f m l h a f t o c c a s i o n t h e m t d i f f i c u l t y i n
t r e a t m e n t A d e q u a t e i m m o b i l i z a t i o n f r t r a s p o r
t a t o d i f f i c u l t t o o b t a T h j t i s s h o w a
h i g h i n c i d e n c e f l i m i t a t i o n o f m t f t h e j t s
c i c c l i y o f k n e e f l e x i a d l s s f t g m o t i o n
T h e a u t h r s h a v e u s e d j n c i l l t h e p r i
m a r y t r a n s m i t o f c o m p o d i f t i n t h e i n t
t a l s t g o f i f e c t o j t h i r e x p e c c e t h i s
u s e i n c h r o c o s t o m y l i t i s h a s t b g t

F u C P o r s h K M D

Annan J H S I I s F a c t u e L t L o d
945 68 74

F m j o n e r s f h o s p i t a l n G r m a n y
A n n a n r p t s 8 c a s o f f r a c t r l s p l a c m t o f
j a r t f t h j n u p r o c s s f n e o m o f t h e
6 t h 7 t h c r i c a l o f t t h o a c i c v t b r a T h
i t l e e n t i t y r p o r t d b y M k l l a r H l l i n 940 a s
c l a y h o v l l r f a c t u

T h e h t i e s o f a l l 8 c a s e s t r k g l y s m l a r
a l l b i g h t a c t r z d b y o m j m t y p i n
t h p p e b a k a l h o u l l e r s W h i l e t a k i n g t h e
e i g h t o f a h l l f i s a l o n t h e l f t a r m t h e
p i t t f l t a p p o l l d b y i m m d a t d b i l t y
r a y e x a m i t o f l l t h e j t t e c a l e d
f a c t u e s f t h 6 t l n d 7 t h c e c a l p i l i c e s

T h e s e p t t s e c a p t d G a l c C r t
t h e p r y 94 n l t u a l l y c e t r a f d t o
t h e m g y A b t a m t h a s p e n t t t o
c a m p n S l i k h r t h e r f o o d v a b e l t h i r
c e u t m d t i d l d C e r m a v i l l e f o o d
t n w a s a t m a t c e l e l v h i l o t r
t t h e r g l e c d t n T h e l a c k f
b a n u t r i t l f c t r s i n t h e d t T h
p o b b l y p r d i o s g f c t t t h f a c t e s
d e s c b d S h l l g s n l b i d l t h t i g
c a e n d t d e d w h t t p g p o
t h e n t h l g a m t u m n u c h e i t a t t h t i n
f i t h l i f t i n f i r e i t t h e i f t r m d h l l e r
t h d i r e c t a t i o n o f t h e 6 t h n l 7 t h p e s t h r g h
t h m c l e f h h t h e f e c u l t i n t
t h l g m e t

T e m t t f t h e s c a s e s g t h h t a d
t F a t l H l l g c o c u r s b y
f r u u B j u G l u w M D

W g l R l d R l l g l U n n l t d F r a c t
u r e o f t h C a r p l S c a p h d P r l i m i n r y R
p o t n l U s e f V i t l i m R p l i c a R e
p l c e m t a t r f c i l n l m j s g 945
67 84

T h b l l j p l y t t h e c a r p l j h l s h
t h t t f r c i s p l i f q t l j d s

p o e s t o p o s t t r a u m a t i c c e r b t e c h a n g e s d e
l a y e d n o n a n l n o n u m n a f t e r f r a c t u r e N
u m n n u s t b d f f e n t a t e l f r o m b i p a r t t e s c a p h o l
L o r s i n d i a n s i c o m p l e t r e d u c t i o n a n d i n
a d q u t e o r i n s u f f c i t l y p r o l o n g e d i m m b l a t i o n
a r e t h e m o s t c o m m o n c a u s e s f o n u m n M a n y
c e s o f n o n u n s h o l t t l e i f a y i m p a i r m e n t o f
f u c t i o n

T h e m e t h o d s f t r e a t m e n t o f u n u n i t e d f r a c t u r e s
o f t h c a r p a l s c a p h d a r

- 1 P r o l o n g t i m m b l i a t i o n
M u l t i p l d l l n g f t h e f r a g m e n t s
- 3 B o n e p e g g o g r a f t i n g o r r a t i o s
- 4 E x t e n s i o n o f o n e o r b o t h f r a g m e n t s o r e v e n
c e s n o f t h e e n t p r o x m a l r o o f c a r p a l b o s
- 5 F u s i o n f t h e s c a p h o i d t h t h e c a p t a t e a d
l u n a t e

6 A r t l r o d e s i o f t h e w r i s t
T h e a u t h o r s a c k n o w l e d g e t h a t a d r i l l g a n d p e g
g g o r g r a f t i n g p e a t i n i s m o r e l i k e l y t o b e s u c
c e s s f l i n c a r e f l l y s e l e c t e d c a s e h e n t i s d o n e b y
a n e p e n e e d a d s k i l l d s u r g o B r i s t o w i
q u o t e d s t a t i g M a n y e x p e r i e n c e d u r g e o s a r e
r a p d l y c o m m i t t h c o n c l u s i o n t h a t t h i s o p e r a t i o n
h a s n o p l a c e i n t h e t r a t m e n t o f a s l d i e r B o h l e r
i q u e d a s s t a t i g t h a t h e h a l e v e r s e n a c a s e i n
w h c h t h e u s e f l e s s f t h e h a n d r e t u r n e d t n o r m a l
a f t e r r e m o v a l o f t h s c a p h o i d b o n e C r a e n e r a n d
M c E l o y b e l i e v t h a t i f a d e g e n e r a t i v e t y p e f
a r t h i t s h a s a l e a d y s t i n o b n g r a f t i n g o r d r i l l
i g w l l r e s t o r e t h e w i s t t n o r m a l a d f o r a n c i e t
u n u n t d f r a c t u r s w i t h a d g e n e r a t e a r t h i t s o n l y
r e m a i n a l f t h p m a l f a g m e n t s a l l p e m i t a
c u l l u r s c h a d c a t d e a r l y e x t r a p o n f t h e
b o n e b o r e t r a u m t c a r t h i t s d e v e l p e d i n t h e
u r o n l g b o h h a d e x c e l l e n t r e s u l t s i n 9
c a s e s S e e r a l d e r g n t j o n s a r q u o t e d

T h e a t h r s c l u d t h a t m u l t i p l e d r i l l i n g a n d
b e p g g i g o r g f t g o p a t i s a e n t s u i t a b l
f t h m r c m p l c a t e l c a s e s o f f a c t u r e o r n o n
u n o n l t h e l a t t e r g u t t h e y c l u d

t t h f r a c t u r e w i t h t h e f r a g m e n t s b a l l y c o m
m i t u d a n d d p l a c e d p a r t i c u l a r l y t h e n v o l v i n g
t h e p o x m l p o r t n

2 O l d c a s o f p u d a t h r o s i s t h e f r a c t u r e
t h u g h t h a s t p o x m a l p o r t i o a n d a s s
c i a t d t h l c a l d e f r m n g a r t h r i t

3 R i n j r y c s e i w h c h d n c a l s y m p t o m s a n d
l s a b i l t y j s i t a f t e r a n a d e q u a t e p e r o d o f i m m
b l i z a t i o n

T h e h o i c e f r a t m t i t h e c o m p l c t e d c a s e s
e s t s b e t w n c o n a l t h o d e s T h e a u t h r s
f a v o r c i s o a d r p l c m e t f t h e c a r p a l s c a
p h l t h a p r o s t h e s T h y h a v e u e d a v i t a l i u m
p l c a n 3 c a s e s

T h e p e r t e t c h q e s d e s c b e d a s f l l o s
W t h t u r n u q t a n d t h h a n d i f u l l a d d u c t o n
a u r v e d i c n m a d e w t h r a d i a l a s p e c t o f
t h s t T h r a d i a l r a d e s l n i t h
a b d u c t r t d f t h t h u n b a c e x t r a c t e d a t e
l y a n l t h e e x t e s o p o l l i s l g u t d i
r e t r a c t d i t r i l y T h e c a p u l i p a c l t r a

v r s ly The fragme ts of th u united scapho d are
 rem v d a d a mbl d in o der to judge the s ze
 d shape of th epl ca The repl ca is s t d
 the pr per p s t The w nd is cl d d
 mold d pl st ca t is ppl d to cl d th th mb
 hand and distal tw th ds of the fo e m with the
 w t dors fle ed 3 degrees The cast is w rn for
 two weeks a d th n a leathe gau tlet replaces it
 th s remo ed f r phys cal th rapy

DANIE H LEVYN H. M.D.

ORTHOPEDICS IN GENERAL

Olm s V S Critical Study fth Kenny Method in
the T eatm nt f Poll mly liti Ph y p tho
logical Principl in th Choi f a t h nique
f r the T eatm nt f Inf ntil Paraly during
th A ut P nod (Et d ntu d l m t d de
K y y l trami t d l pol m ltu Fund
m t fusi p t lgc p l lec d l t cnica
l trami t d l p rah l f til d ra t l
p nod gud l C e p l m t 044 06

The author discusses in considerable detail the Kennedy's technique in the treatment of infantile palsy, is agreeing with her in most points and differing in others. She states that the patient must be able to assist in the gymnastic exercises and hydrotherapy and physical exercises should avoid the mobilization method that have been neglected.

The really st g p nt her meth d i the
1 stenc on ea l y pas i a d acti m bulizat of
th muscles m scl e ducation san ld d th do
meth d of treatment She h lds that the f da
m ntal symptoms of the d ea a m scl p sm
muscle inc -o d at i n a d m tal ale tio
While it i tru th t these a e symptoms f th d i
cas th s th ry l a es o t f acc unt th f nda
m ntal path l gy h h thes sympt m are
l s d

A Sp niard Sanz Ibáñe first d scov ed that the es ntu llesio s ar j ies of the r s d fthe moto plagues Th j ry of the eur ns results n flacc d paraly s which limits the pos ibl ites fcur by any meth d fit tme t The neu on may be cut off m ts c nn tions with the central nerv t act whil thos with th p ph ltr ct em in intact th case th cr as d t of th m des s ppl ed by th p pheral t ct B t fth on is cut fff m ts ctt s wth both th c tal d p ph al t ts flacc d paraly s results Le ns fth and tracts may occu i rying d grees both qu l tatively a d q t tat ly Som times nly th moto pl qes a j d a d in ths cases v ry ten i c nd s pa alyses m y d app ar qu ckly and lmost c mpletely

R - ed cat on of the m l s t o s d f i l t
 child e who ha e ch d th ag of e but i
 childr less th n tw y ars of ag it is ry d f i c u l t
 as th y ca not u d r sta d eq e s t s made f th m
 a d w i l l o t e m i n the m p t o n Th he t
 appli d n the K y meth d a d y h at not a
 mo t h a t d the a th r adf co ta t th r mo-
 th py with l i g h t b t h s h c h e m f e s t h o
 In cases of spasm of th delt ds wh ch is r a e h
 does t b l e th t the rm sh l d b kept
 t e d d t the des as in th K nny meth d b t
 th t they sho l d b pl c d at ight angl to t
 b d y with the l b w s f e d d th wr i t s t d e d
 Th plac ng f the s l e s f th feet ag ust th
 rtical bo d s th Ken y meth d post r l
 t atm t des gn d to p e v t th de l p m t f
 pes qu i s P s t u l t r t m t h s l g b n
 d e a t d i n th d s e

F eally effect t e time t f f t l pa ly
a careful clinical hist l gical d th peut c
t dy sho ld b mad f es of arly cases w th
th ll bo t f p d tric ns d th h to-
path l g cal fi d gs of Sanz Ibá ho ld b tak n
t acout AUDRE G M C MD

AUDRE G M G M D

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

11 n s n C J Varic s of th Es ph gu in Chll
d en A f d l St kh 944 5 5 7

In ca ses of hemorrhage from the alimentary canal
it is imp rt that the poss bl pre e ce f l ge
ment of th spleen and v aco s veins in the soph
g s be v st gated Ths led s t pply t
a ults only it is equally es tial in ch ldr n

Var ces ca ari ei th es ph g as es lt of a
thrombosi in the vena lienal Thelatte c d to
produ es e cess f blood the e i c e
q ence of hich the pleen b c me enl g d As is
ell kn th sple r c es ts blood f m one
large a tery a d the bl d i d ain d to the portal
in through the ena lienal only Th sple has
few c ll tral i a d th e h ch it ha run
th o gh the ph e c ple ic an l ga tr l al l g
ments The v in situat d i th fr t m t ned
l game t f r m te n a e sple u in th r g
f the lowe e d of the e oph g an l the s in
the p e enc of a thromb s f the p lenic ein
become gr atly d st nd d d g i e r e to varic s i
th s segme t f the alimentary canal

Stas s the ena lienals r th pot l y tem i
m ked by th e ma n sympt m i enla gem t
f the pleen asc ts d the vomit g f bloo l
Mte ala g qua tly f blood has b m tel the
hypertrophy f th spl en is abse t as the blood has
bee empt d fr m the o ga d cites ca al be
al e t at that me Of th the e ma n sympt m
o ly the h m r h g mai lth ca se fit c n
be d e c v r d m te ily a d eff cti ly by m a s
of a r e t g e m tion

Seve h m h g e du t e ophage l ar ces n
chlle are me ti c li the p d t i c i t r a r
The uthor r p t n d d t nal g ca es

The orig i th the compl int s often b c e
Var type of fecti n ar ig f c tet l gual
f c t r l n f th it ca s the past hi to y
c t i ed ment f mbulcal infect

Th th r concludes that ca e of u cco nt
bl h mo h g s in hid en roentg ogram of the
esophagus h l l al ays b t ken Th p t ues
h t r t u f l l i g d f c t i the ophagus

Jos h N M D

Lint n R R nd White P D A t r i n u
f l t u l between the Right Comm n Ill
Art ry d the I f r i V Cava R po t o f a
Case of It Occurres f l l wing an Operati n
f a Ruptured I t r r e t l r a t D i with Cure
by Operati n A k S g 945 5 6

Th purpo f th s art l i s t p es t cas f
art n s t u l a b e n th g h t m m o l a
a t r a l th f n a c a f l l g n o p e r
t f r u p t r e d t r v t e b r a l d i c I J r y t
th blood essels w s t r e c g n i e d t th t m e f

th p r t i o i the d s c and the diagn s s f the
fistula was not made until eight months later i he
the p t i e n t compl ned of increa ng dyspnea o
e ert

This case demonstrates a number f nteresting
po t It re e l that surgical removal of a rup
tured i t e r t e b r a l d s c is not without danger to the
gre t vessels which l e on the anterior surface of the
bod es f the lumba vertebrae and it d monstrates
th t the c m m l a c a t e r y can be int r u p t e d
i th t e n d a n g e r i the v a b i l i t y of the limb Ana
tomic st dy of th s e g i o n sho s that the inferior
ve a cava is formed by the union of the two common
ilia ve s to the ight of the median plane in front of
the body of the fifth lumbar vertebra a d behind the
gh t c m m o n ilia c artery The latter crosses the
d s t a l n d of the v cava opposit the fourth inter
v t e r b r a l d s c from right to left a d bec use of the
great t u r g i d y of the artery th vena cava is fixed
t a c e r t a i n e t e n t a g s t the vertebr l column As a
result of this anatomic arr ngement f the right
c m m o n ilia c artery the inferior vena cava and the
fo th intervertebr l spac a sharp cu t or instru
ment such as is used fo rem al f a ruptured inter
r t b r a l d s c may t a n s f i the artery a l vein if it
s u d d e l v f r e d th r gh the ant nor l g t u d i n a l
e r t b r a l l g a m e n t Although the surg on did not
rec g n i e that h s instrument had injured these
els n this patient there seems littl doubt that
the fist la wa prod d i this man r According
to M t e r T a l m a d g a d W a l k e s i m i l r l e s s o n s
h a v e b e e p r o d c e d by other surgeos while they
w p r f o r m g o p e r a t i o n s for ruptu ed interve te
b a l d e s

It appea s offh nd that such a vascular lesion
w u l d r e s l t i e v e r u n c o t r o l l a b l e h m o r r h a g e
An naly is of the s t a t o n h e v e r r e v e a l s that
th blo d i h c h escapes from the c m m o n ilia c a r
t r y w i l l o l l w th path of l a s t r e s i s t n e e S c
the venous pressu e i the inferi ve a cava s a p
p o x i m a t e l y e r e s c a p i n g a r t e r i a l blood w i l n a t u
a l l y f l o i to th large venou reservoi of the caval
ystem rather than t r a v a s a t e i to th p v e r t e b r a l
p a c e s a g a i n s t r e s t a c e f th tissues The e was
n d b t l l y s m e l o c a l e t r a t o n a s e v i d e n c e d
by th a b n o r m l f i b r o u s t s s u a r o n d the great ve
e l s f o u d a t o p e r a t o b u t i c u l d n o t h a v e b e e n
m a s s i v e i n the abse ce of shock follow g the ope
r t i o The diagnos f arterioveous fistula as
m d i th case because of the beg n n g c a d i a c
d e c o m p s a t th e n l a r g m e n t f the h r t w i t h a
c h r a c t r i s t c t y p e of pulsati on b s r v e d on fluo
c o p c e a m n a t i and the cont nu s thrill with
s y t l c a c e n t u a t i n w h c h w a s h e a d f d e s t o r
th r e g i n f th l u m b o s a c r a l a r t i c u l t i o The sit
of the fistula was localiz d p e r a t i v e l y b e t w e n
the right comm n il c artery and th i f e r o v e a
c a b a c e t h thrill and the brut w e t n

Th ombophleb t th n m d t i a
phleb t s a d penphlebitis associ t d m t m by
an abs nce of a cl t n the lumen It is usually initi
ated w th a chill high t m p rature swell g of the
leg m k d t e dermess and ofte r d n s er the
c urse of the in ol d ve It is ch r a t n d v ery
l arg ly by perilymphat c i volvem t ell as
i volvement of the wall of the vein Embolism fol
low g thrombophleb t is r l a t e ly rare It oc
curred n 10 p e nt f the To o t series and in
b ut 12 p e c t of th series analy d by the Mayo
Clin c

Phlebothrombo s ch racteri ed by bl d clot
which fills the lum f the vessel Th o et may
be sudde It s ot companied as a rule th as
high an levation f temperature or with as g eat
swell g of the leg s thrombophl b t s Homa s
has shown exper m nt lly that if o ew hes to c ate
a s -call d al b d lens xpe ime tal unals it
nec ary to dest y th lymph t s M elgat n
of th v n ll not s a rule cr te swellng

I th case of a pl m ar embol sw th id ce
f phl both omb s s of the v e s of the l g ther s
no que t on but that p imal l g t if p ssible
is the operati a d r tment f ch ce b cause t
allow immedi tem bliz t on of th p tent itho t
f ar o t sion f th d s se If th ombus
t ds ab ve the clacl m nt e tracti n of the cl t
e th by m al t t n or s c t on nd f low d
by b ecto and r m l fa sect n f th femoral
v n i the proc du f hoice

In cases f phleb th ombosus w th t y e i
den e of emb l m there are thr m thod f the
apy that may be carr d o t wh th d gno s of
phleb th ombos f the deep fem ral which
e tends up ard int the ilac e h b mad
They re () i c of th a d m al f the
clot—phlebotomy () the use f t ag l s
with ut su gic l p ced r and (3) n ocaine bl ck
f the first to the f th lumb r g gla

I a se s of r ca of th mb t m y f m th
il c v s 8 p t nts had suffer d f m pl m ry
mboli and 4 had h d o ut d v d e of m
b lsm The w e deaths O d th was ot
d e t h d seas th p tent dy t w weeks p st
pe t v ly of r l s ffi ency th s d death
wa defi t ly d e t the d sease

Only pati t had l ter emb l m
Ant co gul t w e ed n all f th ca es

HARR W FINK MD

Hunt W C Kryg J J K nney J G nd
Sn d n v D Th Eti logy nd Pre ntl n f
Thr mbo i f th Deep Leg V n S g y
945 7 78

N ting that th p bl m of e o s th mbos a d
its most se ous compl cat o pulm ry emb l m
btly c mm nd th cont n d t est of ll
phys cians thea th r s p e t a comparat est dy
f th n d ne of n th ombosis f th l g s
400 u le ted a top es ad lts p r f m d th
me h sp t l b f d f r pr t m s e

t t ted I the ste t n d mphas f
c t i f nd m tal d now ell auth tcat d
f cts conce i g en th mbos nd mboli m
the tion l c d rati f the m ch n m a d
p gnosi of en t c la cl t t g dem ds
th t b e d d ed t t types () phl both om
bos defined cl s u ass ated ith
flammati th cl t b glo ly attached to th
v wall d () thr mbophlebit clothing o
at d with d d p d t upon i f m m tio of the
wall ith th es l t that uch cl t s ally
firmly att ch d

Th re i a woef l lack of app crati to h ch
ins serve s th commo est sources f th mbot c
mb l It is st l l e f ly a sumed th t p lmon ry
mbol u ally a i e f m cl t n th f m alo p l
v i n o from th ght side f th heat d
g d of the now mpl dat t th co t ry A
th r l o g and f d ly held f l l y i th t o l y th
g cal patient s d g r of ta ng a pul
m ary embol It f c t th t pat ts affe g
f m med cal d ases fully as s pt blet a d
du ju t as f que tly f m p lmo ry mb l m
Th o ly re l i hop f d c e g th t l l f d e th
f m p lmo ary mb l m l n th w d p e d ac
c pta ce of the n w d well p d f ts sto th
cau es the at a d th an t m cl cat f most
insta ces f e th mbos

A r w of port t lit at p es ted a d
the ba s f th find gs i 35 t p e s pe
fo med by two of th thors i 94 the cl
a p sent d in deta l

Th mbos i f th de p e f th l g ap
p l l ngly freq e t am g mddl g d a d l d
p r s h a e f c d t b d f o a g p d f
t m th i c d e f th ombos b g 5 7 p t
In th s es the was l t t l d f f e i the
cid ce f th omb med cal (53 p e c t) a d
f g cal (46 9 p t) p t nt me (52
p e t) and me (53 5 p r c t) Phleb t
the a a c c m pl cati f th mbos
h d m nor l n th c es (8 p c nt)

The gratest gl f to f r g th mb
f r m to i th l t em t v dd co fin
m t t bed f ap ly amb lat ry l d pers
th t the be fit f e r c th d of g a ty
th m te c f effice t s c rcul tio
Pl n ned d s p r v d ol t r v m o m e t z d
the l m to f too m ch m f r t r th l g s
h lldom ch t d e the c d f thr mbos
a d t s all too f q t q l p l m ry mbol m

Th pmp oses f th t dy eport d h th a e
() t omp e t es f ca es f q l s e f m
th s m hosp t l () d t r m th c d ne f
th mbos f the f m l l d bd ct ns and
(3) t l f p bl the fl ts f c o
th mb s form t n Tab l t p es nt d
h w g the c m p t d ta f r tain ascula
p thol gy—g d r v e class ficat f i
nes f o o a t p e s h p e r m d t M l t mah
C t y H p tal P r t l d Org A th t b
l t d cates th locat f v o thr mb

situation other than the lower extremity. The clinical diagnosis of phlebothrombosis is presented together with an extensive discussion on the prevention of venous thrombosis.

In this summary the authors state that in the last 200 cases dissected of the femoral and iliofemoral veins was carried out. Like others who have examined the femoral vein they find that phlebothrombosis of the lower extremities begins in the deep vessels of the calf and tends to propagate toward the heart and that thrombosis of the femoral veins alone is an uncommon occurrence. Both sets of veins are the most frequent sites of the distal base and for this reason they are the most important of all the possible sources of both fatal and nonfatal pulmonary emboli. There are no important differences between the two sexes in the incidence of the thrombosis of the deep veins of the leg is a frequent entity. All classes of middle-aged individuals patients who suffer as in what is usually thought to be a longer than very few days. This is usually a disease without prominent symptoms. Phlebitis as a cause of a complication of deep extremity vein thrombosis is very uncommon. The diagnosis is important.

The logical approach to the problem of phlebothrombosis and pulmonary embolism is prophylactic. Hitherto there have been far too much emphasis on diagnosis and treatment as a final tool to prevent on. Prophylaxis is best based on simple and readily carried out physiological principles.

Reeducation of physician and nurses with respect to the site and causes of thrombosis of the legs is urgently needed. The incidence of phlebotomy in a small series of medical patients proved to be significantly less than in the first 100 cases. It seems probable that the institution of active exercises for this group was responsible for this decrease.

HERBERT F. THOMPSON, M.D.

Dennis C. Dill, Jr. Following Femoral Vein Ligation for Thrombophlebitis Relief by Factual Clinical Case of Renal Impairment and Illness. *Clinical Case Reports* 945: 7-64.

The incidence of bleeding complications in patients undergoing a total hip replacement is high. The present demonstration of the high incidence of bleeding complications in patients undergoing a total hip replacement is a serious problem. The incidence of bleeding complications in patients undergoing a total hip replacement is a serious problem. The incidence of bleeding complications in patients undergoing a total hip replacement is a serious problem.

The author reported a case with high ligation of the femoral vein. The complication was developed. A fifty-year-old male patient was seen. The patient developed a total hip replacement. The patient developed a total hip replacement. The patient developed a total hip replacement. The patient developed a total hip replacement. The patient developed a total hip replacement.

At operation an incarcerated femoral hernia containing necrotic omentum was found. This was repaired and sulfathiazole was implanted in the wound. For three days postoperative the patient had a temperature as high as 101°F but during the next ten days he was afebrile. Eight days after surgery he presented a positive Homan's sign on the left side with tenderness and local heat in the left calf. Symptomatic block with 1 percent procaine of the first second and third lumbar levels relieved the patient. Twelve days after operation well-being returned and local infection appeared about the wound. Sulfathiazole (4 gm per day) was given orally and in spite of this the temperature rose to 101.5°F three days later. The sulfonamide was then stopped as it was believed that the temperature elevation may have been due to the drug. In the next three days the wound healed and the temperature dropped to normal. On the twenty-first postoperative day swelling, tenderness, and a positive Homan's sign developed in the right leg but this was not relieved by symptomatic block.

Ten days later a firm thrombus could be palpated from the knee up to 12 cm below the inguinal ligament. The calf increased in diameter about 8.5 cm and was pinker and warmer than the left. It was decided to ligate the femoral vein above the saphenous opening and use a local anesthetic as the safest course of treatment. After this was done the entire leg was engorged and deep blue and the patient complained of pain and numbness in the leg. The skin was quite tight and the dorsalis pedis pulse on the right as faint in spite of a procaine sympathetic block which gave only minimal improvement in temperature. The right leg gradually fell. It was estimated that about 3 liters of fluid were lost into the thigh and four hours after operation the patient blood pressure fell to 40/10. Eleven hundred cubic centimeters of plasma and 500 cc of blood were needed to return the pressure to normal. Six hours after operation there was a difference of 16 cm in the circumference of the thighs and less difference in other measurements. The leg became more blue and black, and the skin creased and the skin temperatures fell. The patient eventually hours after femoral ligation the deep fascia was discolored and lacerated above and below the knee. The leg rapidly became warmer below the knee.

Three days after fasciotomy the patient developed chest pain, consolidation, fever, and a chill. The ray showed a left-sided pneumonia. The temperature dropped and penicillin therapy.

Eight days later the patient had melena and hematemesis and it was feared that a mesenteric thrombosis might be complicated by the picture. The vomit contained blood for a week while the patient was critically ill. Two weeks after fasciotomy the wounds were clean and granulating. Motor power was lost below the knee. He sat on the thigh pressure was impaired.

Two days later he developed edema of the thrombophlebitis in the left leg. A ray of the apy was

Koop C E a d Bullitt L Gelatin a Plasma
 Substitut The Eff t of Gelatin Inf n
 on th S bs quent Typing and Cross Matchi g
 of th Blood with Method of Elimin ting th
 Ph n menon f Pseudoaggl tin ti n Am
 J U S 945 09 8

The authors note that a ly n the course f t d
 n gelatin as a plasma substitute it as observ d th t
 th add t on of gelatin to blood e ther i v t o o i
 vivo causes a defite accelerat th t of ed
 m ntat of the eryth ocyt Th ph nome
 soc t d with the form t on of aggl gates f l g
 a d sh rt compact rouleaux and has bee r f d
 to by Ivy as pse doaggl t at Th ffects f th
 pseudoagglutination of eryth ocyte th ed m
 tati rate i man have been d m t t d d t
 h b n h n that th addition of glyc to gl
 t n blood m tu lters the pseudoagglutination
 d pr e ts the increase in sed me tat n rate In
 asmuch g latin is being u d s a pl sma s bsti
 t te in the pr t a d treatm t f h ck a d
 s many patient ece g gelatin m y sube
 quently q ire transfus o s f whole blood f the
 rection of em a it becomes impo tant t d
 term e whethe ps udoaggl t ati n interf res w th
 the accu ate performa ce of blood typi g d
 matchi g The pres nt report based on xp ri
 ences by the a thors des gned to cl rify the p bl m
 Th pr ced u s carried out in v t a d i vi
 a d observa ces of the r con ection present d n

s m deta l I co cl on th a thors te th t f l
 l gth tra u fus of gelat the eryth
 cytes x h b t p d gglut at cha te i
 by the f m to fl ng nd sho t c mpact rou
 E e wh n thes l ux are i clo asso t
 ther pp a ce ot th t of cl mp ng Th ph
 nom of ps d aggl t ti o ay tr
 f w th the gr p g f blood i pat t h h d
 p n fus s f gl t
 I o match g th blood of patie ts bo h
 r d i f s n of gl t pseudoaggl t t
 f ry g d g s ccu th o m l donors c ll
 h n m d w th s ch se a Nos ch ph nomen
 ob rv d i s pe s s f the p t t ell i th
 do ors ser Pseudoaggl t at f th eryth
 cyt s i les ma ked wh a s per ce t gl c s s l
 ton w t s add d to the erythr cyte serum
 s sp son Ps udoaggl ti at i s abol hed by th
 addit of l t of p c nt glyc n phy o
 l gical l n ol t to th eryth ocyt rum sus
 p s
 Th f p t glyc e sol t in phy
 s logical salin l to way i terfe e th th
 g pin r m tch g f blood In pte of th
 app ra f ps do ggl t n ton f the eryth o
 cyt n blood f m p t t h have rec ed
 p o f s o of gl t practical d f ficulty
 h y t b e n o t e d by the tech c a s in typ
 i s s m t hing uch blood

HE R F THURSTON M D

SURGICAL TECHNIQUE

WAR SURGERY

Wils n H Sec ndary Suture of W r Wo nd A
Clinical Study of 305 Secondary Closures A
S g 945 5

E per e ce d r g the past year has re empha
sied certain surgical principles involved in the
ma agment of war ounds foremost am g wh ch
is seco dary cl sure It is believed that the prin
ciples involv d i the succ sf lma ag me t of a
ounds are equally ap plicable to certain traumatic
w nds n c vi pra t c

Adequate débridement without sutu e of var
w u ds in th i tal stage of treatment is a neces
sary principle because of the extensi ed vital tion
of tissue so frequently f u d in ar unds the e
t s co t m at n of s ch o nd tl fo eign m
teri l the time interval ften present bet cen
rece pt f the i j ry a d the i tal surg cal tre t
m t d th nec sity fo a number of different
su g ons to in pect the w und ithin a relat ly
short period f t me Th s fact alo e o ld m ke
pr mary cl a dangerous procedure except in
s m p l cases such as s me u ls i l g
th he d face r ch t

E te s déb d ment ithout suture requires a
long p d of tm f r healing u l s secondary
cl s r p r f o m d wh ch aga t th mlt y
pr cipl of returni g th old r to duty soon as
po bl S condary cl on the ther h n l us
lly m s a bett r f t onal and c smetic result
mo rapid impr ment in the g eral c d t n
f th p tie t d t the cl sur f n op n wo d
and th a da c of the p s bility of l g p
t ted ulcerat n a large c catr hich m y r
lt f om la k f blo d s pply to the c ntral area

Th u ds most suit bl for sec dary cl s e
ar th se i l g soft t es wh ch ha b n
leq t ly déb l d itl the past t lays h ch
l t been b j c t d f e quent d g ch ges
a d h ch pp cl c lly cl a W d lder
th t n d y a d h g light fct pa
t ts h r f e r f may b prefa d cl ur
by h r t p e i d of arm w t d gs It sh g d
th t p c ll may t l the u of d l d cl u
t th ca s wh ch t not ow les bl

Local fa t r s esse t f r c d y d lo
sure f l m r m fect cl s with t t n
deq t hem t s th a da f l d
sp a d t bl po to j e r pl t g Sv
tem f c t r s e free l m from mia f m u ad
quat d et nd fr m f tigue A n r m l ed cell
c t hem glob pl s prot a d t m C
l l th blood ar espec ll mpo t t

Sulfo mides h b m lved s t cally
d l call n so p t t b t t f a r t t t
that cc s ful l res p x l l i a h g i r
t c f ta es th ut th of the s d gs

Pr parat on of th wound for closure was meticu
lously carried out The opt mum method of closure
va ied Clean ounds adequately débri d within
the previo s s iv to seven days and ith the patient
fever free were cl s d with plain or vertical mattress
inte rupted sutures Wound older than ten days
usually req ed period of v t dressings These
ounds are less pli ble the tissu s having become
relat v ly fixed and they are best cl s d after total
or partial e c on

Th e conclus ns we e drawn fr m 3 5 seco dary
closures p r f o m d upon 209 patients The interval
f om the tim of déb dment to the time of closure
var ed f om four t f ty seven days and the s ze of
the vou d from a fe c timeters to one wou d
measu g 3 by 8 by 4 cm The major ty of the
ounds we e on the e tr mities however secondary
clou was performed up n almost e ery part of th
b dy

In 79 ca es cultures wer made pr o to the ope a
t n and the staphylococcus was d sco e d in 73
wound

In some stances complet closure was best ac
c mpl sh d by c ering th ema n der of the wound
ith a split sk n graft t the t me of partial closure
by secondary sutu S PHE A. ZIEM V MD

S ndell D H S m Surgical Aspects f the
African Soldie J R A my M C p 945 84 14

These observat n ar b ed n th auth r s t o
y ars of per ce as Su g cal Sp c list and later
as Office Commandi g D i son in Military H s
pitals in East Afr ca wh e the bulk of patients are
nati e sold ers r Askari

It is a nov lty for the surgical nes comer to see
i bi d r s of shin g black faces contra ted
g i st the white bed linen The first e ntial in
uccessful tr tme t of the African is to k ows me
th g bo th m Aninit l pr blem is the languag
Th tves peak o ly S ahi a d till the ev h
rr ed M O ha lear ed a smattering of this lan
guage h i very much ha d capped

The Askars are cru ted from th illages in the
h te la d a d few h been in close c nt ct ith
Eu ope bef r Th y are a fi c and warlik
p pl th r reco d fo m ny ce tures h shown
nd w th tra ing th y become first cl sold ers
Th y com int the Service f om a p miti e b ck
gr nd Li g n a m d but with n furni hings
pt for f w ski s on th grou d as a couch and
w a go lyalo cl thorananim l h d h know
nothi g of hyge e r san tati n H s det con sts
m ly of posho—gr und maize meal—and veg ta
bles fruit and tain m ut f m at h h can
g t t H ttain nd r f lphy qu n l m cul
d l p m ta d i ery erget

Th Aska an us to get w ll qu ckly that
t l f ficult t l p h m bed wh h feel w ll

elevated u til consc o s es occurs to av id any pos sibil ity of asp at on i t the trachea

Since 194 th s method has been used n 80 cases The attitude of the a th rs is favorable and the technique is be ng used i creasingly

The s cc ss of this technique is d pe de t upon the exte sive and ad q ate t pical anesthesia of the pharyn glott s and upper trachea

M Y KAR MD

E n F T I ffection from Spin I An Igesla n Warning L ct L d 945 48 15

I of tal cases of p eu lomonas pyoc neame i giti foll wing spinal n th s a are recorded The ca es c d th n three days of on nother An effort was made to dete m the p t f c ntamina t C ltu s were take fr m the tap of th al e c nta n and from po ts of p ss ble c tamina t th negat e results

Wh t r the so ce ffect the m ral is ob v u clear defined rules fr the steriliz o f the appa at df sp ala lge a must be adher d t

Recommendations for the st il at of syr ges a d needles by bol g were gi en in deta l

MA Y KAR MD

Simp n E E C n ul l ns during G n l Anes th l A F g d J M 945 3 6

Con uls ons may occur d r g tr us d chl fr m vin the e thyl ne cyclop pa e as well as ether a esth There is confusion th gh t th l t on the et ol gy of th c nd t

I he p c ff v r seps s d hot hum d ext rn l s o d g s m t be n important t l gical f ct Oth possible caus s are a imp t es in th esth tige t e ce sord fic cy fca b n d o d it bil ty f th nerv s s s tem a lat nt tendency to ard fits e ot n p oduced by strep tococe an l heat str k

Convul ions can app ar at ny t me altho gh the impo t nce of n u ogen c stimu s is t esse l w th the convuls: s c m mencing at th m ment the p t n m is gr ped in the f c ps or in l o s soo as th re is trac n on the viscera Th m t l ity rat s bet n 20 nd 5 per cent

The p per m th d of t eatme t is al c nt o rs: l The author suggests deepe i gth sthes a by d sco tinu g the nhal tional anesthet d sub st tuting the ntrav nous dmi istrati n of e of the barb turates or of m gnesium sulfat tratra ch l yge r pl c g ce bags on th body nd sorting to phlebotomy nd drainage of the pin l fluid f seve hyp rte nd velops A ca e r po t is rec ded of a convuls n which l st d th rty f m nut s in a seventeen y ar old b y d r g an p pendectomy unler nitrous ox d etl an sth s a Th blood pres ure d g most f th s t m w s too gh t be reco ded Th treatment a t ed br gh t about a cessati n f th convul on d the pati t made n u compl cat d co ales ce w th n e d nce f neurol g cal cha g s

MARY KARP MD

Cole F Th U e of Curar in Ane the la A Re view of 100 Cases A esth s l gy 945 6 48

One hundred and fity eight intravenous inec tions of curare were given to obtain r la ation in 100 abd m nal surgical procedures Most of the patients re anesthetized w th cyclopropane

C a s obtai ed by brewing the various parts of several pecies of the strychnos genus A 2 per cent st rile solution is th drug used in th s series Activ ity f the drug is due almost enti ely to the presence of a crystall able substance d tubocurarine chlor ide The cu re eff ct is due to the interruption f nerve impulses at the my cural j nction so that th muscle ill respond neither to injected acetyl chol e nor to st m lat on of its nerve The act on is enti ely peripheral and is i hib ted by prostigm e

Muscl s are aff ct d in the follow g o der first those supplied by the cranial n rves followed by th s f the trunk nd extremities and finally tho e of espiration The d phram is the last muscle t be paralyzed Recovery occurs in the reverse ord r The incidence of laryngospasm is b leved to be smaller v hen curare has been given Endotracheal i tub t on may be facilitated by its use

The use of curare with a l ght general nh latio al a esthes a may ha advantages over spi al a esth a in that t elimi ates some of the unt ward signs a d sympt ms compl cat g subarachnoid erv root block well as th possibil ty of perma n nt damage to the sp nal cord a d spi al n rves themsel es

Two absolute contraindications for its use are my sthen a gavis and the inabil ty of the anesthetist to perform artific al espiration Another contra dicat on is the p sence of impair d renal funct n beca curare s partly destroyed by the liver and i p t el m at d unalt ed by the kidn y

The pat nt s ag vig r weight nd depth and rate f p rati n were consider d in calculating the d e B sed n weight alone a dos of 1 mgm per k l g m a d f om 2 to 3/4 mgm p r pound of body w ght was us d

All injections were unt avenous and were made rapidly no si gl administ ti n requir g mo c th n t s cond

U des rable s de effects c ns ted ent ely of res pirat ry depres ion Mld depres on was seen in 4 cas sev e depression without ctual apnea occurred in 8 cases and apnea w s s en in 4 case Art fic l resp rati n had to be in tituted in 1 of the 100 cases Cauti n is suggested against admin tering cura e w th pent thal ether or trnbromethanol beca e these drugs hav sl ght curarif rm p oper ties Ether is th m st po e ful

The youngest pat ent treated was three years and ighd 23 lb the oldest was ninety o e years Th average dose was 73 7 mgm The nt rvs is betw n the first and second doses rang d f om te minutes to h ndred a d sev nty fi m nutes the a r age being se ntly fo r and ight t nth m nutes

Wh le pharm colog cal ide ce s ggests th t th e cretion f curare is ery rapid nimal perime ts

ha sh wn that the drug m y hav om cumul
tiv action

Rel at n vas ons d de ll nt n g f the
oo cas fair in 6 and poor case

Whil the ex cta d compl t path l gical h nge
p oduced by cura n t known m t nve t t rs
seem to agree th t cur ppears ry c lai t
c upy a la tng plac the ph mac p of a es
thes a Cyclopr pa cura omb d may wll
becom the a thet c f boce f bd mun l
su gery

MAR K MD

SURGICAL INSTRUMENTS AND APPARATUS

Siz I W Th Eff t of T mperatu n th
D g sti n f Coll g n Sutu nd Surg cal
Gut (C gut) by En ym s nd by th S b
utan u Ti su f th F g A S g
945 23

Nati oll g n fibers f m the li o t id s
are e tremely re tant t nzyme but wh n me
h n call mm ut d t rv m ll p tcl s r
h ted th y b om f ly adly dg ted by
ymes Relat ely resistant ac d s ll n b ef te
do can be m ce ated t d l te susp ns s
(though th oll g n may n t pas th gh filter
pap r) and sub qu ntly pr c p tated t ref rm
fib rs f m la struct s th e f the n
al S h t eatme t r ds th m lat vely d est
ble by m y diff e t a m l d pl te ym s
S mul rly th fib r dg sted d b o bed aft
impl tat in th mal b dy nd the availabl
ev d n ggests th t th act o i b u ht about
by e ym liberated f om wh te blood cell

The p es nt w k w u dertak w th th pu
po f study g qua t t t ly the ct of p
t coll g n s a funct on of temperatu d
comp ring th s lts w th th se o the dg t n
of oll gen mpl t d th bcuta e stis ues of
th f Histolog cal evid n e su gests that th
dg st n f sut mpl t d i mal t u
b o ght about h fly by l uocyt Exp nment n
th act n of hum na d b f bl od th dg t n

of c ll ge sut es d cat th t bl od e ym s d
tta k th sut s F ct nat by ntrifugat
of b f blood hows th t m t f the p ote lyt a
to of bl od s c ted th th l uocyt rathe
th with th pl m o r d blood c li ft has t
y t be pos bl t bta n a stabl pr p at n f
pr t a f m l c cytes rd to d term
wh th r o t the ct t n ergy f th dges
to f olla n sut s by l c cyt zym s in
vt th sam s th f th dg et n f th s
t s mpl t d in th t s e f the g m It
m on f i a t that th d t n f c ll ge
tu es b th n o and n t n ases po e
tially with t mpe at b t the yme
stud d p b bly n t th same a th es wh h
dg t th s t the t t e
ges o e p d gly d f r t
O p ct al p t of th s t dyles th po
s bl ppl cati f th ult t p bl m f h m
s g ry An mp ta t p bl m l d th u
f catgut t sle nd t f th ut b fo
h l g ompleted w th the lt g p n p
f th w und

It pp t f om th s w rk ll g n nd cat
gut (lyp l m n ry catgut exp m ts h v b
perf rm d th th f) that imp ta t fact
d t m n g the t f d t d b r p t on f
utu es in the b dy tempe t r In p t a
c ea ed temp tur f 4 C m ht b exp cted t
p od c a oop c t c th at t h h
ab b bl t d t v d th if
the h m n yme (r b t l ym th
case f uaf ted w ds) b ha e l ke try p m o p p
s If the hum n t to mla to th t n th
f og a ns t mp rat f 7 C wll p du
d ubl n th te f d e tract f th t r l
ther t t t pp nt th t y l atio
b dy t mpe t m ypr d ma ked c a u n
th t f b r p t f the s t L s t
p m t w th ta d t (th c ll g r
s gical gut) nd cat t mp at eff ts dges
t n s mul r to th f r th pla ut

B JAMES G LDM MD

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Carril D S and Clagli P Roentgen Pathology
of the Chest in Battle Casualties 1m J
Rtg 045 53

Due to the difficulty of the clinical examination in a severely wounded soldier and because of the multiplicity of pathological changes the aid of the roentgenologist becomes invaluable both in diagnosis and surgical management.

The lesion most frequently encountered by the author was embolism of the tall cfr g bodies but injury with hemorrhage into the lung parenchyma polymorphous thrombotic atelectasis and tracheal phagmatocytosis and mediastinal abscesses were also seen. In case 15, in order to illustrate the usual and atypical features of the lesion.

Th cas pres t () h rn at f the t m
a h nd pleen int th f l f c chest th ough a
nt i the left diaphragm (2) bilary br ch l
fistula (3) p t t g m tall f b ly th o gh
th f l f g l f iaphragm n l ieen th l u
m hem per t um but p m th ra (4) m
t ll c f g b dy th h t th l d l
hem r hag l b l te al pl ural effusi (5) tra s
m d t l ch t i j ry th l l g m t f th m
tall cfo gn body th right l n g (6) f g b ly
th right l g th h y d o i neum th a ani
c dental azyg l b (7) me l asti al m i hys ma
with grad al pr d f the air t th b f s
the neck, and (8) p l mon v fat mbol m f llo i g a
mple fra t f th shaft f th right tib ani
f f ula

All of these are related with the respect to the programs. Every good collection that makes a family similar can be the author to make the following suggestions.

t B caus of th f e q e c y t n d i p h g
 t c l s t p r f b l t a m u n a p t e n t
 t h h t j u r y n t h p r i g h t p o t i o n o f t h s
 i m p b l e n t h l a t l c u m b n t p i t i n i
 l r t d t e c t s u b h

1 O p n e t r a t e d r o n t g a f g r e a t
 1 p h g m b h i t h g t
 3 S e h m p m t h r a a c c m p y g h t
 n c h f e b e e c a p l a t d l b c a f t h
 1 p l u r a l f s a i p e c a f l f f f t
 1 p e r s o n f l e c t

h t c r a j y t h t r s h s e n s e t g
t c f e o p l e a t g f c t s u c h m
p y m l u g b e s s r m e d s t t w h n t h
w d r r e r e a l e n t a m t d t h t
f c l t h g T L C r t M D

Pomeran R Grady H G P l n M and Mag
n M Spontaneous Cholecystododenitis
tulin a Patient with Primary Hepatoma of
the Liver R d l gy 044 43 58

Spontaneous cholecystoduodenal fistula associated with primary hepatoma of the liver is exceedingly rare. Of special significance is the fact that diagnosis may be made preoperatively by means of roentgen studies.

A detailed case report of the surgical and autopsy findings presented. Diagnoses as made by means of roentgenograms and fluoroscopic studies. Some barium tendinoid in the ear strake near the superior portion of the duodenum. The barium surrounding a negative shadow. At four hours there was a 7 per cent retention of barium in the fundus of the stomach on the lateral curvature aspect violently extending against the left lobe of the liver. Speck retention of barium also seen in the duodenum in the region of the possibly described negative shadow. Gallbladder examination on failure to show any evidence of gallbladder shadow. Remainder of the gastrointestinal tract revealed that the barium tendinoid in the gallbladder diagnosis of cholecystitis. First instance in the cystic duct was made. L enlargement was noted clinically on the film.

To date, 90 cases of portal biliary fistula have been reported in the literature. The most common cause of the fistula is oncologic bladder disease with the formation of calculi which eventually perforate into the testis. The incidence of primary calcimata in the testis is always rare because of the presence of primary tumor of the testis. Cholelithiasis and cholecystitis are diagnosed preoperatively and confirmed at surgery and autopsy is indicated. Although rare, it should be kept in mind by the alert urologian.

M LRI D SACH M D

N m nt W B Th Use of N w C nt t M
dium (Vl c Ray pak) in th F m l G era
tl e T t fm J Ob t 945 49 53

V1 rayoj ke s a r d p q e c n t r t m d i u m
c t a i n g n g a i c i o d c c m p o u n l (2 4 d i x
3 o d o - 6 m t h a t t a h y d p y i d a c e t c a c l) l
a p o l m t r i c f m f p l y v l a l h l l t a a p u l l
b b e l

A c r i k m b e i j e c t l d i c t l y i n t t h e
t r c a n l t h r g h t h c c a l p e n g i m m e l i
t l f l l g w h r o e n t g r a p h c t l e s e
m d r t h l p a t m b e i n t r o d u c e d i n t a
r u b b l e l a g l l l o n b c h b t r l b e n
l c e d t h t c a i t y L a c h f t h e s m e t h i
h d i n t d c a t u

In the mill hall water can be sprayed
for the treatment of the mill
the water can be sprayed through the mill

stly b lie e or wh for hire ad nce u f u d d r
disproved th ne in an eff t to th art ju tic

In July 1940 B T Adam Ir ident f the
M cota State Medical Ass cat n call d jo t
meeting f s me members f the A oc at and f
th Mi ne ota Stat Bar As ociat on t di cuss the
p olem of u eth c le pert m d cal te t m y A
comm ttee wa apoint d by th p cide t w th the
app al of th Cou cil of the M n s t State
M d cal A ci t The comm tte as empow d
t re se tho e co rt cas s which medical t st
mony appeared to the C urt to the atto neys r t
m phys ca s t ha e b e n contrad ct ry to
i lic te that o e o more of the m d al w t c
app ar l to be con cously de iat g f m th truth
I h m d cal t stim ny de se t y ot t b
c fne l to nyp ticular type of legi latio n r t
a y part cular type of med cal te timony nor t a v
g r t e l r e urt It v a s t clude all e l cr m al
an l p e on l i j y cases a d all cas s t r d b f
th Indu trial Commi ion The C mm tte M d
ic l Testim y consisted of 6 memb rs p e s e t g
the va io sect s of th State At it first me t g
it d terminated the f ll i g p l cy

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mu t s bmit n v riting b f tate me t t the
C mm ittee g i g the n me f th phy i c n t be
i vest gated and al o the n me f the p i c p l of

the tr l in order that tra crpt of the nt
t st mo y can b obta d

That a t c pt f the e t i te t m o y of th
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d po al f the Comm ttee O ly by th method
ill t b able to bt a true kno ledg f all th
facts a d as st the arr al at a unb d nd
j st p on

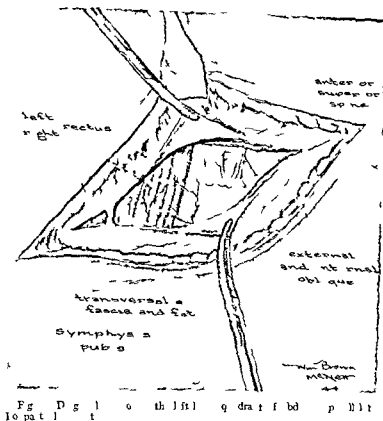
3 Th t m mbers of the Stat A soc tio th
pec alt mu t b v ll g to appear befo
th Comm tte whe quest d to do so d p e
thei op th e gard to the te t m v i ques
tio

Th C mm ttee ha de m l it l iabl t k 3
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s t t th invest gat of a c se Ital ha th
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t v d y po i bl l gal c m p l e t ns It h
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g t ch cte the Comm tte s b m ts a compl t
p t w th th t anser p t t the State Bo d f
M d cal E m iers Th s Board has jud c i r v po r
d can p e d o evoke th off nd g phys an
l c e

It ag d th t le att tio b d cted t the
rup l l v e ll s the u crup lo
m d cal pert ve y little c b a t p t d f m
th p og m Jo n K N MD

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to 5 years later the bowel was mobilized as far as the splenic flexure and anastomosed to the rectal stump. To avoid an artificial abdominal stoma Jerome Lynch (69) advocated amputation by the perineal route in which the bowel is divided at the level of the peritoneal floor with no attempt at approximation.

Independently under the title of abdomino-perineal sacral or anal excision Berro Pannett Arnold (6) Fratt Pack (80) Berweret and Ivory Wilensky and Wangenstein (98) describe their technique in one two or three stages with preservation of the sphincter musculature while Horsley Wood and Wilkie Babcock (9) Gallis Arnold and Shea (7) Wangenstein (98) Dixon Dunphy as well as Zininger and Horvath offer contribution to the literature in which the rectum rectosigmoid and lower sigmoid are mobilized and resected with immediate re-establishment of continuity by open or aseptic end-to-end anastomosis.

By the foregoing it is obvious that remarkable progress has been made toward eliminating a colostomy either by preservation of the sphincter musculature or by reestablishment of continuity of the resected lower sigmoid rectosigmoid or upper rectum.

Why should a colostomy be avoided is a logical question. How many times after stating that an artificial opening on the abdomen is imperative have we heard patient say:

Doctor I would rather die than have a colostomy. One is prone to wonder how many patients have died needlessly by refusing such an operation when radical surgery by other means was not made available to them. Surely many and to wear curbs could have been effected. Too often colostomized patients are socially ostracized a train of psychoneurotic manifestations may be suffered even to the point of suicide marriage may be interrupted and many are unfit for employment and thereby refused a means of livelihood.

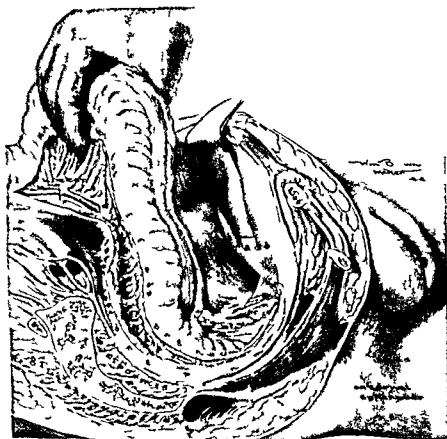


Fig 3 Mt m ll test es d pl d f m pe t f l l by m f p ks m bl
t f km l bevu Left l t ral pe t l l f h be sed t f we t Th
su j ed bch d base f bl dd by su th mes l l af f th pent m

F d l f S p l i V l P r t d R e l N s l e t f C l t y i l l
O p i T i t f k i l d S e u l C —H F P



Γ 4 Th f m t l l t d at l l f mm l b f t
 Th tu lly ll m d l l d th d p r r d d b a t u l l
 b l d

hood Babcock and the writer have many case histories in their respective files which serve to substantiate this. To date he and I have transplanted the colostomy to the perineum or anastomosed the colonic to the rectal stoma with or without resection in 51 instances with but 1 death—mortality 1.9 per cent.

In this group were two physicians and one dentist who were handicapped in the performance of their daily tasks. Several domestic were compelled to seek positions elsewhere. A child developed a marked inferiority complex because her classmates teased concerning her abdominal opening. A woman was unable to hold her position in a bank, an assistant superintendent of a large Philadelphia hospital after 2 years of service was about to be relieved of his position until transfer of the colostomy was effected. An evangelist was unable to carry out his duties and in 3 marriage was postponed until transference of the colostomy was made. These patients attest that they are more pleased that the discharge of offensive gas is less evident than the perineal opening is more convenient and easier to care for and that the evacuations are more satisfactory and less frequent. Should not the opinions of persons afflicted with this dreaded disease who have been subjected to a colostomy life and now possess a perineal anus (anal sigmoidotomy) serve as an index as to its efficacy? As Horsley said a few years ago: "Something more than mere existence should be included in the objectives of surgery—if the patient can be made more comfortable and life made to seem more worth while after a procedure that offers about equal chance of cure of the cancer as other operation it is obvious that this technique should be a logical one."

The main objective in the treatment of cancer is of course complete eradication of the disease. Even though a colostomy is contraindicated by many sacrosanct intestinal and duct preservation of the sphincter musculature may remove the radicality of the operation. It has become apparent that the view of Miles (47) as to the lateral and particularly the inferior zone of prevalence of metastatic dissemination. The painstaking pathologic

anatomic study by Westhues in 1934 showed that cancerous connective tissue and lymph node metastases are situated at the level of the carcinoma or above it. Gabriel, Dukes and Bussey (42) concurred in these findings and remarked: "Lateral or downward lymphatic spread is only found in a late stage of the disease when the hemorrhoidal lymphatics are blocked by metastases." Collier found no evidence of retrograde metastasis to nodes situated 3 centimeters below the primary site although Gilchrist and David (45, 46) noted 4 such instances. Collier further observed no metastases along the lateral zone of spread where the inferior border of the lesion was 3 centimeters or more above the mucocutaneous junction (anorectal line). It may be assumed therefore that the inferior zone of spread is relatively unimportant whereupon the sphincter musculature may be preserved provided the lower border of the growth is 3 centimeters or more above the anorectal line (6 centimeters above the anal margin). Based on an experience of over 1,000 operations Lynch (70) in referring to the work of Dukes remarks:

It permits one to discard entirely such radical and unnecessary operations as that popularized by Miles.

It seems appropriate to inquire: If the sphincters may be preserved in all cancers situated above the six centimeter level in what proportion of cases do these occur? A few years ago the author (12, 13) reviewed a series of 1,995 cases of malignancy involving the anus, rectum and sigmoid colon in which the distribution was accurately noted in 1,401 instances as shown in Figure 1.

It is evident that only 10.2 per cent of lesions (4.9 and 5.3) occur within the distal 5.5 centimeters of the bowel (above the anal margin) and 19.1 per cent (4.9, 5.3 and 8.9) within the distal 8 centimeters. It may be deduced therefrom that at least 80.9 per cent of cancer or those above this level may be removed without sacrifice of the sphincter muscles. Mandl (71) in 1922 observed that of 461 operations for cancer of the rectum the sphincters were preserved in 27 cases. He concluded: "Wherever possible in situations where the tumor is at a sufficient distance from the sphincters these should be pre-

TABLE I—RESECTED WITH COLOSTOMY

N m		case sec	Re- sect- ed	f r	S r v l s	
H y d	d S b d l (5)	65		3		s m
R k	(90)	3	50-68		3	m re
Lockh	M m m r y (6)	3		8		
J T	(56 57)	955	7		6	
Rail	d (8)					
Abel	()	5				
J	D F (5)	956			6 ⁵	
B dl	(3)	6	5			m
G b l	()	90				
M les	(7)	3	5			
Sca borou b	(3)	66	6	99	6	m re
H y d e	()	3	766			m
Pf if	(8)	8	5	8		m re
Ca ll	()					

served. In my own series of 68 radical resections the sphincters were preserved or continuity immediately established in 167 cases or 80.3 per cent.

Does preservation of the sphincter muscle augment the operative mortality? Mandl (72) is quite definite that it does not. In a combined series of 414 radical resections for cancer Babcock (10) and the writer reported a mortality rate of 6.6 per cent for 22 cases of abdominoperineal proctocolectomy with out colostomy and 4 per cent for perineal proctectomy without colostomy. Immediate establishment of intestinal continuity for upper rectal, rectosigmoidal and low sigmoidal growths has but recently become popular and while the mortality rate is slightly higher it may be assumed that with added experience the rate will be decreased. It will be noted that except for the group reported by Dixon namely 266 cases the series are not large. Zimlinger and Hoxworth who prefer this method cite 18 sigmoidal resections with death—an operative mortality of 11 per cent. Babcock performed 16 single clamp aseptic oncologic resection with death or

9.2 per cent. Excluding those in which operation was done as a palliative procedure the mortality is 4.3 per cent. Wangenstein (98) reports 8 cases and Horsley 3 cases without a death. Over a 12 year period Dixon reports a mortality rate of 12.1 per cent and 3 per cent respectively for those with a view of cure and those as a palliative procedure. Of 41 cases recently performed his mortality rate was 2.4 per cent. Fallis published a series of 31 cases with a mortality rate of 6.5 per cent. During the past year we have employed immediate end to end anastomosis in 16 instances 1 with a view of cure and 4 as a palliative procedure. My first patients died due I feel to too much reliance upon indwelling duodenal siphonage. Since that time complementary decompression—usually appendicostomy—has been employed without death. The mortality rate for the 16 cases however is 12.5 per cent. A distinct advantage of reestablishment of bowel continuity in the pelvis is the avoidance of impotency so common in abdominoperineal extirpations. Jones (38) found the incidence to be 9.5 per cent.

It is difficult to compare the survival rate of an operative technique in which the sphincters are preserved with those in which the muscle are sacrificed because of the relative infrequency of performance and sparsity of reports of the former. In citing the experience of various surgeons as to cure the percentage of operability (resectability) should be considered as well as the mortality. Attention is called to the fact that for the most part the following reports were published a few years ago. It is only fair to assume that if more recent data were available the resectability and survival rates would be increased and the mortality decreased.

I have surveyed the results achieved by several European surgeons including Lieber of Vienna, Payr of Leipzig, Sauerbrook of Munich, Gulel of Jena and Kirchner of Tuebingen the average and year cure of which were 9 per cent and 3 per cent respectively.

In contrast are a few reports where the sphincter muscle was not sacrificed. For example Mandl (7) states that per-

vation of the sphincters does not influence the lasting results adversely. Based on a series of over 1000 operations the percentage of 3 year cures was higher in cases in which the sphincter apparatus was preserved (33 to 37%) than when sacrificed (25 to 31%). He maintains that similar results were obtained by Eichhoff (Kuettners clinic) and Libram (Layr clinic). Our combined group of cases is shown in Tables I and II.

What degree of continence has been experienced following various procedures to preserve the sphincter muscle? Mandl (71) an ardent advocate of the Hochenegg method reported that of the cases in which circular suture was performed 19.3 per cent of the patients were discharged as continent complete control was effected after a period of time in 49.4 per cent. Following the pull through method the number of continent patients increased from 58.3 per cent to 64.5 per cent. In contrast however is the publication by Koerbl of the Eiselsberg Clinic who of 100 cases of complete continence in 36 per cent employing Hochenegg technique and 66 per cent with the Kraske method. Gersuny recorded satisfactory continence in 75 per cent of his cases. Du Lan a pupil of Kocher reported that 8 patients had complete and 32 partial control and were completely incontinent. In a discussion of continence one should be mindful that preservation of the sphincter musculature is not necessarily synonymous with preservation of the sphincter function. During the perineal portion of the operation proctostomoidectomy even though the external sphincter is preserved its innervation namely the inferior hemorrhoidal and perineal nerve derived from the second third and fourth sacral plexuses are surgically interrupted along the small filament from the fifth sacral and coccygeal plexus—the lesser perineal nerve of Morestin yet following operation and in many cases within a few days voluntary contraction can be observed actively and passively. One recalls the experiment of Elliott who found that the external sphincter even when separated from its nerve supply was not prone to degenerate and is characteristic of other voluntary muscles. That it retains the responsiveness to the faradic

TABLE II — RESECTED—NOT COLOSTOMIZED

Name	Age	Sex	Resection Type	Miles Ligation	Survival	
					Years	Months
B. Block	48	()	93	66	8	9

Abdominal perineal proctostomoidectomy
Perineal proctostomoidectomy

66

current is shown at the time of sphincteroplasty usually 10 days after proctostomoidectomy. In some 160 cases sphincteroplasty has been performed by means of a faradic stimulator especially designed by George C. Henny, M.D., director of Research Physics at the Temple University Medical School. As will be described under technique the sphincter musculature is divided posteriorly it is dissected free and retracted anteriorly and laterally. Preservation of the three tracts of muscle bundles composing the external sphincter offers little difficulty except that it is a trifle tedious. Approximation of all divided musculature is effected at the time of operation except the posterior quadrant of muscle because of the necessity of presacral drainage. Our great problem lies with the internal sphincter which in itself is a most important structure. Designed to aid in the expulsion of feces it also assists to occlude the anal aperture by tonic contraction. This muscle representing an aggregate of inner circular muscle fibers of the rectum into a single component measuring 2 to 5 millimeters in thickness and 1 to 3 centimeters in width (49) and innervated primarily by the sympathetic and parasympathetic nerves maintains perfection in control especially of flatus and liquid feces. With this operation efforts to preserve this involuntary muscle have not been too pleasing. By the same token while we feel that the somatic or cerebrospinal innervation to the external sphincter is but minimally impaired the visceral innervation to the internal sphincter is definitely interrupted. The investigations of Goltz and Ewald on dogs are very interesting and bear some influence on our problem. These workers who were able to keep their animal alive for years after transection or destruction of the spinal cord below the seventh cervical segment observed that

while diarrhea was interposed defecation gradually became normal one or two evacuations were noted daily and on each occasion the rectum was well emptied. Patients following proctosigmoidectomy are capable of voluntary muscular contraction of varying degree noted subjectively and objectively. Approximately 80 per cent of our patients may be classified as continent yet perhaps 40 per cent wear a protective pad or strip of gauze not of necessity but often because a sense of security from soiling is afforded. Truly our most difficult task is with constipated individuals who for a period of year have become accustomed to the habitual use of cathartics.

TECHNICAL FACTOR

Thus far our purpose has been to consider the development of surgery of the lower intestine and colostomy elimination to answer inquiry and compare various procedure in which the sphincters are preserved including proctosigmoidectomy with colostomized extirpations. A substantial series of cases namely 73 resections of the colon and rectum performed without colostomy by Babcock and the writer and recently reported (11-17) from their respective services the department of surgery and the department of proctology has served to support previous discussion. We shall now consider our experiences and the technical factor of this operation for which reason my own series of 236 cases of cancer of the anus rectum and sigmoid colon from the department of proctology for the 3 year 7 month period ending April 1944 has been reviewed. In this group there were 143 males and 93 female 236 were white and 20 or 8 per cent were colored the average age was 32 years the extreme 7 and 85. The distribution was as follows sigmoid 27 or 10.54 per cent rectosigmoid 67 or 28.39 per cent rectum 132 or 55.7 per cent and anus 10 or 3.9 per cent. The histologic type in 36 of the 56 cases was reported adenocarcinoma 23 or 63.9 per cent epithelioma—squamous cell 6 basal cell 1 malignant melanoma 2 fibrosarcoma 2 and leiomyosarcoma 1. Tumors were graded according to Broder classification in 19 instances grade I 17

cases grade II 17 or 57.9 per cent grade III 67 and grade IV 8.

Of 236 patients I personally resected 208 an operability or resectability rate of 88 per cent. The remaining 48 patients were treated by palliative colostomy exploration and closure local excision or fulguration others refused operation or sought counsel elsewhere. The operative mortality of the 208 cases (16 deaths) was 7.6 per cent. This group included such procedures as the Mikulicz and Rankin modification Babcock's single clamp method of sigmoidectomy and those designed by Cuneo Miles Lahey Turner Hartmann and Lockhart Mummery 145 were performed by the Babcock technique of abdominoperineal or perineal proctosigmoidectomy without colostomy and with an anal sigmoidostomy.

As is our custom all patients are admitted to the hospital 5 to 7 days prior to operation. A complete examination including cystometric studies is made and the patient is placed in fluid caloric nitrogen and electrolyte balance. Fluid freely by mouth are encouraged—a minimum of 500 to 3500 cubic centimeters daily unless contraindicated. Sixty to 70 per cent of our patients with rectal and sigmoidal cancer showed hypoproteinemia during the preoperative period the nitrogen equilibrium is established and maintained by a low residue diet in four feedings carbohydrate 400 grams protein 20 grams fat 60 grams and amino acid (casein hydrolytic reinforced with tryptophan) 500 to 400 cubic centimeters (13.5% solution) orally each day. One or more blood transfusions are administered in quantities sufficient to raise the erythrocyte count to four and one half million. To assist in avoiding hemolytic transfusion reactions and their sequelae sodium bicarbonate sufficient to maintain a urinary pH above 7.0 is given. We have come to realize that there is a high incidence of subclinical avitaminosis previously unsuspected but a potentially dangerous stage which may occur as the result of diet inability to utilize vitamin failure of absorption of fat soluble vitamins in the absence of bile or depletion of vitamin reserve by excessive demand in malignancy. Routinely by mouth thiamin chloride 50 milligram nicotinamide 100



E M l l t f th t l t ly fl h l by t fl b t f m t trod
 to f th h l t th t l l f th sa ococ y h l t l t A t y
 th tos m f f l tly l If th pt I t f th f m th p st t
 l sem l es les

F d t f Spl t M d P x t nd R t th l m t f C itin ly n tle
 Op r t v T t t f k l l d S cm d l C c —H \ E Ba

milligrams ascorbic acid 100 milligrams and pyridoxine 5 milligrams are prescribed daily. On the fifth preoperative day a nonabsorbable sulfonamide is begun by mouth and continued to the morning of operation. Sulfasuxidine succinylsulfathiazole which we have employed in 131 cases (102 proctosigmoidectomies) of our total series is given in an initial dose of 0.5 gram per body kilogram weight followed by a dosage of 0.25 gram per kilogram every 4 hours. More recently sulfathiazidine phthalylsulfathiazole a sulfonamide having a similar mode of action has been used in 54 cases including 19 proctosigmoidectomies. The initial dose is calculated on the basis of 0.1 gram per kilogram weight the maintenance dose is estimated upon the same basis.

All patients in this series with the exception of 2 with acute intestinal obstruction irrespective of age or general condition were operated upon under spinal anesthesia. During the past 18 months fractional or continuous spinal anesthesia has been employed. The Woodbridge formula of 0.3 per cent pontocaine in 1 per cent dextrose solution being used.

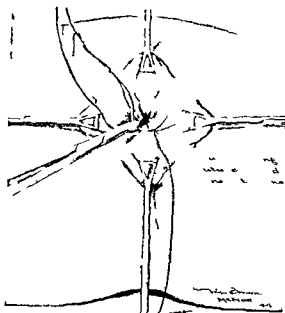
OPERATION

Abdominal phase. The abdomen is opened through a left oblique incision 3 centimeters above the inguinal ligament beginning at a point medial to the anterior iliac spine and ending to the right of the midline above the pubic line. Ordinarily the left anterior rectus sheath is divided and in a few instances we have detached both the rectus and pyramidal muscles from the pubic spine as suggested by Cherney. The liver is examined for metastasis; the median lumbar upper and lower mesocolic areas palpated for nodules and the extent of the growth determined. The patient is placed in the Trendelenburg position and the pelvic cavity is cleared of small intestine by hot packs. The left lateral half of the mesosigmoid is freely divided wide of any malignant infiltration the incision being carried downward to the rectovesical or rectouterine sulcus. In the course of the dissection the left ureter iliac and the perimetric or ovarian vessel are exposed. The perimetric or ovarian vessel may be divided and ligated.

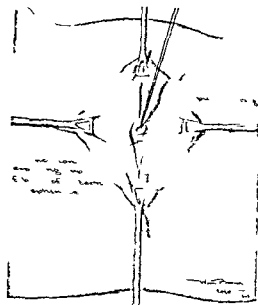
The sigmoid with attached fat and mesosigmoid is mobilized toward the midline. The peritoneum on the mesial side of the sigmoid is incised downward continued around the right pelvic brim and across the sulcus between the rectum and bladder or uterus to meet its fellow of the opposite side.

Ordinarily transillumination is employed to visualize the inferior mesenteric superior hemorrhoidal and sigmoidal vessels and their communicating arcades. By such greater precision can be exercised of those to be preserved which is essential for that portion of the sigmoid to reach through the perineum. The necessary vessels are clamped divided and doubly ligated. If desired the lateral peritoneal leaflet of the descending colon may be divided in order to slide the bowel to a lower position. Having determined the point of viability by observing pulsating arteries or by the character of the bleeding when the small vessels on the surface of the bowel at the level of resection are incised it is identified with black silk. By gently inserting the hand into the postrectal cellular space in the pelvis the lower pelvic sigmoid and rectum can be stripped from the anterior surface of the sacrum as far as the sacrococcygeal articulation. The lateral ligaments are rendered prominent and divided as far as the upper surface of the levator ani. They may or may not require ligation. Anteriorly the rectum is separated in the female from the upper portion of the vagina and in the male from the base of the bladder as far as the prostate. Care should be exercised to avoid injury to the seminal vesicles and vas deferens. Five grams of sulfathiazole powder are dusted over the viscera which is covered by the great omentum and the peritoneum is closed. Interrupted sutures of No. 32 gauge alloy steel wire are introduced for fascia and No. 35 for skin.

Perineal phase. The patient is changed to the lithotomy position on the specially designed spinal mattress and the rectum is packed loosely with antisepticized gauze. The anal canal is closed at the pectinate or anorectal line by a strong purse-string suture. A posterior incision is made behind the closed anus and carried around and immediately below the closed anorectal line. The sphincter



F 7 I l ph A l ca l l d by p rs
t g t h h pl d xa tly t th t l (pe
tin t) l



Fg 8 I m d f t f d b h ith closed
st t d by la t l t th parse

muscle is identified, separated and retracted as is done in our operation for hemorrhoid (14). The sphincter muscle is divided posteriorly. Usually a single transverse incision through the fascia propria, which is closely adherent to the periosteum of the lower border of the sacrum, is all that is needed to mobilize the rectum posteriorly. By making traction on the bowel, the levator ani muscles are placed on the stretch, provided the lateral ligaments have been divided during the abdominal phase. The levators are clamped, severed and ligated. Anteriorly the superficial and deep transverse perineal muscle are retracted. Cautiously the line of cleavage between the rectum and prostate is followed until the base of the bladder and the seminal vesicles with the vas deferens come into view. In the female the rectovaginal septum is separated by blunt and gauze dissection until the upper portion of the posterior wall and uterus are exposed. Mobilization being complete, the rectum and lower sigmoid are drawn through the wound and enclosed in a towel. The segment of bowel identified with black silk, noting viability, should protrude well beyond the skin margin. An anterior pelvic floor is

established and the perineal and anterior sphincter muscles are permitted to assume their normal position. A curved perforated metal drain is inserted posteriorly along the sacrum to evacuate blood and serum during the first 48 hours. Dressings are applied; the extruding bowel is slit at point of or above viability (5 to 7 centimeters) to allow for retraction, and a 28 gauge rubber tube is placed and tied in the bowel. The rubber tube is removed after the first bowel movement—usually the 3d or 4th postoperative day.

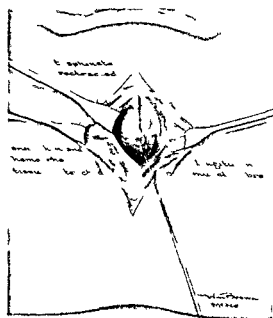
In this group, namely 14 cases, invasion of either or both at the time of operation was encountered in 26 instances, or 1,9 per cent. Distribution and surgical disposition was as follows: Small intestine was involved in 5 instances; resection in all (1 death); bladder in 5, with partial resection in 4; uterus in 5; hysterectomy in both vagina in 6; posterior wall resected in all; prostate in 6; partial or complete in all; ureter in 1; resected abdominal parietes, wide excision. Liver metastasis was found in 7, or 7 per cent. In 2 cases of regional lymph node dissection by microscopy was observed in 4, or 37 per cent.

Of the 145 patients 137 survived the operation a mortality of 5.5 per cent. The 8 deaths were as follows: peritonitis in 4, pulmonary emboli in 2, pneumonia 1, and myocardial failure 1. This was an unselected group excluding growth within 3 centimeters of the sphincter musculature (6 cm. of anal margin). In this series there were 49 consecutive resections with 1 death, an operative mortality of 2.04 per cent.

1. Postoperative treatment. The transfusion of whole blood given during the operation is followed by 5 per cent glucose in isotonic saline solution, additional blood and plasma are ordered if there is any doubt as to their need. Inhalation of high concentration of oxygen is given for a minimum of 24 hours for the purpose of effecting a reduction in the amount of nitrogen thereby diminishing intestinal distention (40). Warwitschen suction is in force during the operation to avoid vomiting and regurgitation of vomitus into the lungs which according to Wangenstein (90) is the most frequent cause of postoperative pneumonia and is continued for 48 hours or more.

The patient's status as to hydration and acid base balance which cannot be divorced from each other is of utmost importance. Dryness of the skin, thirst and capillary turgor but especially the urinary output per 24 hours, vaporization from skin and lungs, comparison with preoperative fluid balance, and blood studies, the plasma protein specific gravity of blood plasma and whole blood, cell volume of venous blood by means of the hematocrit and McClellan-Ulich test for tissue avidity are helpful indices, while total serum carbon dioxide content and serum chloride, daily urinary chloride concentration, loss by perspiration by duodenal suction and by the Liebock intra-abdominal sump drain will help to a certain electrolyte status.

Nitrogen balance and the level of the blood protein have but recently been recognized as important part of the preoperative and postoperative care of the cancer patient. It must be realized that there is a period of approximately 2 hour fall in nitrogen excretion when intravenous administration must of necessity be employed if nitrogen equilibrium is to be maintained. As previously reported

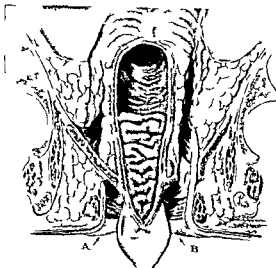


t F g o B y g t l t t t b l t t s e
t e d f m t h t l l d t t d l t l y

(16) in a series of 57 patients 4 or 3 per cent were held in positive nitrogen balance after operation by the administration of whole blood blood plasma and amino acids in liberal quantity. In other words 15 or 27 per cent showed crum protein levels below 6.5 grams per 100 cubic centimeters. In contrast however were 1, patients in whom no treatment was given of which number 15 or 88 per cent became hypoproteinemic.

It is our practice following resection to give 2 00 to 4 000 cubic centimeters of fluid each day during the immediate postoperative period or until the patient can tolerate sufficient quantities by mouth. The amounts and values usually required to maintain fluid caloric nitrogen and acid base balance approximate the following: 1 000 cubic centimeters 10 per cent glucose in sterile distilled water 1 000 cubic centimeters 10 per cent glucose in physiologic saline solution with 300 cubic centimeters amino acid (15 per cent of) sodium lactate¹ (1-100 cubic centimeters ampul of M/6 sodium lactate dis-

The mou f h me) sol sod mla ee) d com
 p i h d z ma f be bo d i k logr m
 m) roe mou ol HCO₃ def (vol ac p ed



F 1 Sph t m les t t d t lly
po g th l t B L t m f h be
l mp d d d d l t d G t t d
pt l t h a th l d t m

solved in 500 cubic centimeters 10 per cent glucose in sterile distilled water represents a one sixth molar solution and is equivalent to 8.4 grams sodium bicarbonate) sodium sulfathiazole 2 grams twice daily dissolved in 40 cubic centimeter of sterile distilled water blood plasma or lyovac 50 cubic centimeters daily and whole blood 500 cubic centimeters on 1st and 3d postoperative day. Such represents a fluid intake of 5,480 cubic centimeters a caloric value of 695 nitrogen 6.5 gram sodium chloride 16 grams and sodium bicarbonate 16.8 grams.

Ordinarily the intravenous route of administration is employed but when access to vein is difficult we do not hesitate to utilize the subcutaneous and intra ternal means of injection. In no instance have we encountered any untoward reaction with blood blood plasma glucose and saline or amino acids (5 per cent solution) when the intra ternal route has been used.

The resources offered by modern chemotherapy are of paramount value in preventing and combatting infection especially peritonitis. Patients are given sodium sulfathiazole 2 grams twice daily beginning the morning following operation. Guides are the urinary output the blood sulfathiazole

level and the number of erythrocytes in the urine. Sodium bicarbonate is used routinely. If the intravenous and oral routes are not feasible 0.8 per cent sulfanilamide in one sixth molar solution sodium racemic lactate is injected subcutaneously.

Sulfasuxidine succinylsulfathiazole is given in suspension in the same dosage as before operation namely 0.5 gram per kilo ram body weight every 4 hours as soon as the patient is able to tolerate liquids by mouth usually on the 3d or 4th postoperative day. As previously reported (17) in our series of 145 cases in which an abdominoperineal proctosigmoidectomy was performed there were 8 deaths 4 of which were due to peritonitis. Of these namely 4 only 1 had been given sulfasuxidine preoperatively but not postoperatively. Sulfathiazole phthalylsulfathiazole has been employed more recently in 34 resections (9 proctosigmoidectomies). The drug given postoperatively in amounts equal to the preoperative dose namely 0.1 gram per kilo ram body weight every 4 hours in suspension as soon as liquid are tolerated by mouth. A definite decrease quantitatively of the coliform organisms has been noted by stool culture. In no instance have we encountered any untoward reaction. It may be mentioned that of our total series of 208 resections to April 1944 in addition those to September 1944 intra abdominal soiling occurred in 11 instances as the result of perforation at the time of resection contamination in open anastomosis or slipping of the clamp in closed anastomosis yet there has been no fatality.

Abdominal wound infection and dehiscence have been infrequent complications and to a great measure we believe that it has been due to the maintenance of adequate protein and vitamin C levels and to the use of oblique muscle splitting incision and Babcock's alloy steel wire. In our series there were 2 instances of abdominal wound infection in 145 cases or 1.3 per cent.

Following proctosigmoidectomy patients are permitted out of bed usually on the 6th to 9th day and recently the majority have been discharged from the hospital on the 11th postoperative day. Approximation of the posterior sphincter musculature is made by

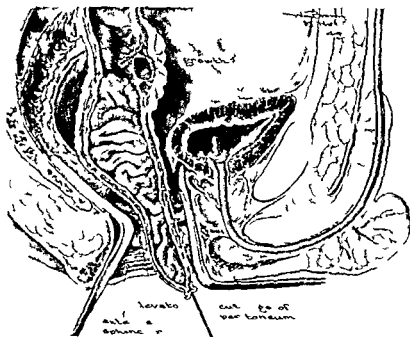


Fig. 1. Sagittal section of the rectum and sigmoid colon, showing the internal structure and the location of the sphincter muscles. The label 'levator ani' points to the muscle group at the top. The label 'cut. of peritoneum' points to the peritoneal layer. The label 'sphincter' points to the internal and external sphincter muscles.

before the patient leaves the hospital but if there is purulent drainage from the presacral area the sphincteroplasty is postponed for a month. This operation requires not more than 3 days hospitalization.

It is worthy of mention that the presacral wound consumes about 3 weeks for complete healing and closure—approximately that of an ordinary anorectal fistula. Thus in the majority of our recent cases patients have been able to return to their former or perhaps lighter occupations in an average of 6 to 10 weeks following operation. In our other type of atelminoperineal extirpations in which a large perineal wound is made at least 3 months was the average period required for healing (12).

SUMMARY AND CONCLUSIONS

The evolution of surgical extirpation for rectal and low sigmoid cancer designed to eliminate the establishment of an abdominal colostomy has been discussed. A serious effort is being made in this respect. It has been shown that preservation of the sphincter

muscles does not augment the operative mortality. In more than 80 per cent of the cases the sphincter musculature may be preserved and so far as one can judge it does not affect the rate of survival.

From a gross series of 712 cases in which radical resection was performed without colostomy, a group of 208 personal extirpations of the rectum and sigmoid for carcinoma has been selected as the basis for this discussion and therefore an attempt has been made to evaluate and compare impartially this series with other present day procedures.

It is our opinion that the Babcock abdominoperineal technique of procto-igmoidectomy without colostomy and with preservation of the sphincter muscle possesses merit. It permits radical removal of the malignant bowel and gland-bearing areas and in spite of a high rate of resectability (81 per cent) enjoys a low operative mortality (5 per cent in 143 resections) of 40 per cent in 49 consecutive resections. If all wounds discharge of the patient from the hospital reduces the period of wound healing and affords early return to work.

Improvements and refinements in technique such as the establishment of an antero-lateral pelvic diaphragm have prevented descent of small bowel into the perineal wound precise maintenance of essential blood supply has avoided retraction and necrosis and preservation of the sphincter musculature has offered varying degrees of continence. It must be realized and we are frank to admit that the sphincter function following proctosigmoidectomy is not perfect nor that for which we strive yet in approximately 80 per cent of our cases continence is cited and between 90 to 95 per cent of patients are able to carry out their daily occupations without inconvenience. If one may judge from the 51 patients in whom the abdominal colostomy was transplanted to the perineum then a perineal anus or anal sigmoidostomy is a distinct improvement over even a well constructed stoma in the abdomen.

Finally the physiologic derangement of patients with rectal cancer in whom extirpation is contemplated is deserving of careful consideration and therefore special attention should be directed toward the maintenance of the fluid caloric nitrogen and acid base balance.

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 fth I t m Ed t d by H W All h m th d
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 4 AR HI L E J Am M A 93 573
 5 Id m D f G h r t d d d (46)
 6 AR H R W t J S 937 4 9
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 8 BA coc W W S Ch N Am 93
 9 Id m S g Gyn Obst 94 7 48
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 3 Id m M d W Id 934 6
 4 Id m J Am M A 94 6 363
 5 Id m J N t M A 943 9
 6 BACO H E T H T E W D d G O C
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 6 C LLE F A K E B d M I TYRE R S
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 47 G RD A D Ch h M d 8 6 4 463
 48 G F d E J R A h g I h y l 897
 63 36
 40 GO CH R V P pl A t m y P 7 N
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 Phil d lphu L & F b 939
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 53 HACHE J W kl W h 888 4
 4 Ho J S S Gyn Ob t 937 64 3 3
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8	I	SLE	H	W	Ch	g	935	7					
83	I		M	B	ll	Soc			884	6			
84	I	T	C	A	h	kl	Ch		19	7	48	60	
8	I	IR	D	B	T	Am	d	oct	Soc	94	G	96	
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EXPERIENCES WITH ANEURYSMS IN AN OVERSEAS GENERAL HOSPITAL

SAMUEL P. HARBISON, M.D., F.A.C.S., M.J., M.C., A.U.S., St. L., M.S.S.

THIS report is limited to arterial injuries which have not necessitated ligation at the time of the original debridement. In a general hospital in a theater of operations the majority of such cases consist of aneurysms either false or arteriovenous in type. The term pulsating hematoma is used interchangeably with false aneurysm to designate any arterial leak which results in a blood or clot filled sac into which the artery is continually pouring some blood so that a palpable thrill or an audible bruit or a steadily enlarging mass are characteristic findings. The enclosing sac may be little more than partially organized clot bounded by muscle, fascial or skin surfaces or it may be a fibrous firm reasonably stable envelope depending upon the site or duration of the lesion. In loose areolar tissue such as the retroperitoneal space a leaking

F m th G I S g r v Sect C I H p tal
L S A my



F d b
(L R d P P I P S)

artery gives rise to a progressively enlarging hematoma. Although pulsation and bruit may not be detectable the process has the characteristics of a false aneurysm in that it has the opening in the artery the same progressive enlargement and possibility of hemorrhage. Arteriovenous aneurysms although of considerable interest do not constitute a much of a problem in this theater as do the false aneurysms. For this reason emphasis is laid upon the latter.

The lesions which we are discussing represent arterial injuries that are not usually apparent at the time of the initial debridement. They are caused by a variety of missiles. The series includes gunshot wound (rifle, machine gun, revolver) and all sizes of shell fragments. In the formation of an aneurysm there must be one constant condition; however the injury to the vessel must be partial and therefore a small fragment is the usual cause. Should complete severance of a vessel occur retraction and clotting will take place or the vessel will have to be clamped and tied and no aneurysm will be formed. These are the problems of the forward hospital. In only 1 of our cases was this condition not apparent (see Case 9).

We have observed 30 cases of aneurysm in the past 20 months of overseas operation. Of these 20 have been false and 10 arteriovenous in type. Figure 1 reveals several significant facts. Nineteen of the 20 patients with false aneurysm were operated upon. Serious hemorrhage either externally or internally into the tissues was the indication for emergency surgery in 12 of these. The duration of the lesion varied from 4 days to 3 months. In the arteriovenous group of 10 cases all of them in one major vessel no patient was operated upon for hemorrhage. If the decomposition effect of the attached aneurysm is considered this result to be expected. Further the series shows that gangrene should rarely



Fig. 1 c 1 d

Fig. 1 c 1 d
 Dool t t dy bef l f th m ed t y h th fist l d l ted
 l k fill f th sa l Dool t t dy mm l t ly ft l se ft l
 mp d t y how g c m pl t fill g f th f l e sa S foot h t flm
 h p pe t ca l l g m t d S foot h t flm h g t f
 h t t m l k ft pe t

following ligation of major vessels if there has been an adequate time interval for the development of collateral channels and time for the restoration of blood which may have been lost in large quantity after the patient was wounded.

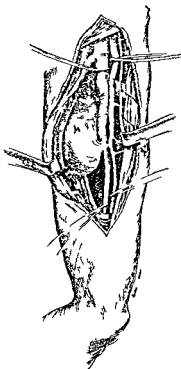
Often the presence of the lesion is not discovered for some days or weeks. Perhaps many small leaks seal off and never leak down. In some the vessel wall may have only been contused with later rupture through the weakened wall. In 1 case not reported here a false aneurysm of the brachial artery made its appearance 3 months after injury. In the arteriovenous type there is almost always a period of a few days before diagnosis is made. Often it is weeks or months. In this connection it might be well to predict that many of these lesions will be discovered in the zone of the interior once small fistulae may cause no symptom.

Diagnosis is very simple in almost all cases in which a murmur or audible bruit is discovered. There may be a so-called pain. The murmur heard over the false type has been systolic in time in all our cases. Often the actual vessel involved may be difficult to determine but

it is always assumed to be the major vessel until proved otherwise. In all of the arteriovenous aneurysms the murmur has been continuous with a systolic accentuation. In this type the slowing of the heart rate upon obliteration of the fistula is pathognomonic (Branham's sign). The reflex blood pressure changes have not been constant in the early cases. In certain vessels this test cannot be applied e.g. the subclavian. Venous pressure measurements may help.

Differentiation between the two types of aneurysm is essential because of the difference in treatment. Not only are the arteriovenous cases safe for transport but they seem to require a longer period for the establishment of adequate collateral circulation. Hence these patients usually are evacuated to the zone of the interior unless intervention is indicated because of increasing nerve symptoms, the association of a large unstable false sac or because it is necessary to improve the distal circulation which has already been shown to be inadequate.

Change in cardiac physiology of a serious nature are not anticipated for 3 months at least. In Case 16 almost 4 months after



F b D w t p t C 6

wounding there was demonstrable cardiac enlargement but the return to normal was rapid following operation. Tachycardia may be noted early especially in fistulas near the heart but since the Army patient remains in a hospital throughout the course of his illness observation will preclude any deleterious effects. Embolism arising from either type of aneurysm has not been noted in this series.

There is one pitfall in the diagnosis. A firm hard mass over which the skin is red dened is not necessarily an abscess. In Cases 2 and 1 a preoperative diagnosis of abscess was made. In Case 12 considerable numbness was required to prevent fatal hemorrhage. In another abscess beneath the angle of the jaw incision resulted in a sizeable stream of blood from the internal maxillary artery which although easily controlled was quite unexpected. Aspiration of any suspicious mass should always be done first. When clot or blood is found attention is directed immediately to the proximal and distal control points.

At the base hospital under careful observation it is justifiable and desirable to postpone intervention as long as possible. Risk of hemorrhage or critical diminution of circulation is lessened by means of pressure dressings immobilization and perhaps sympathectomy. Every effort is directed toward carrying a limb long enough to survive on its collaterals when complete obliteration of the channel becomes necessary. The majority of the limbs distal to the false aneurysms present a palpable pulsation even when the leak is a large one showing that some blood is reaching the limb through the main vessel. Thus a slowly enlarging aneurysm or a hematoma may be looked upon as a desirable safety valve in any case in which early ligation otherwise will result in gangrene.

Collateral circulation anatomically consists of a reasonably constant set of vessels which may take over the blood supply to a part in the event of interruption of the main artery at any given point. Physiologically there is little that is constant about it. Swell in spasm and infection play important roles. The evaluation of the adequacy of collateral circulation may be very difficult. If the vessel proximal to the site of injury is available for selective compression Matas' test is easily applied. In many of the cases this procedure has not been possible and since the majority of the operations have been on an emergency basis the prognostic value of such procedures is slight in false aneurysms. However in the evaluation of the case there are certain guides to the safety of future operation. A diminished or absent arterial pulse in a warm or pink distal extremity obviously is a good omen for one is certain that pressure is being put upon the collateral channels which are already functioning. A normal pulsation prompts one to prolong the observation period as long as possible.

When the circulation is critical certain observations are made to determine whether or not it is safe to observe longer. The presence or absence of a distal arterial pulse is determined manually or by means of the sphygmomanometer. The temperature is noted with the part exposed to room temperature and the

blanching reaction noted by elevation of the limb to 30 or 40 degrees. The color is quite important but may be a poor sign in dark skinned individuals. Pinkness is always a good sign but cyanosis may be misleading in that fairly good circulation may exist in its presence. Whiteness is of course significant. Nail bed reactions to pressure have been found very valuable. More elaborate tests even when possible in this theater have not been found to be necessary. Decisions which are based upon the data mentioned have proved sufficient.

In critical cases the value of interruption of sympathetic impulses is very great. In the emergency cases such treatment can be carried out immediately prior to the attack on the vessel. In elective cases it is usually done a week before. The danger of initiating spasm during operative manipulation is reduced. Five cases have been sympathectomized—3 femoral lesions and 2 popliteal. In all it was felt that the procedure was of definite value. Novocain block of the sympathetic chain single or repeated was done in 3 cases—1 femoral and 2 popliteal aneurysms. The blocks seemed helpful in all cases but whether essential or not could not be said. No help was needed in any of the upper extremity cases and no blocks were done. If uncertainty as to the adequacy of circulation following proposed obliteration of a large vessel exists especially in emergency procedures it would seem unjustifiable not to employ sympathectomy if the patient can tolerate additional surgery. In the lower extremity the procedure may be necessary for the later rehabilitation of the limb anyway. Novocain block as a test of the efficacy of proposed sympathectomy has not been satisfactory. Usually the need is urgent and permanency is desired. Lumbar sympathectomy is performed through a muscle splitting flank incision with resection of the 2nd, 3rd and 4th ganglia.

In the series of false aneurysm there were 6 cases with associated nerve injury. If the minor vessel and retroperitoneal cases be omitted this incidence becomes 60 per cent. The high rate is to be expected because of the proximity of the nerves to the great vessels.



Fig 3 Diodrast dye film taken 9 days after operation. Shows the thrombosed femoral artery and vein with aneurysmal sac.

Although of course primary consideration must be given to the vascular lesion increasing nerve symptoms may hasten the elective operation. At times ischemic paralysis must be distinguished. The increasing toughness of the fibrous tissue reaction excited by an aneurysm is a very formidable process and lysis of a nerve from this scar becomes increasingly difficult with time. Thus an indication for early intervention may be to facilitate dissection if the nerve be an important one. Because of the usually long operating time required to take care of the arterial injury and because of the distortion of tissues and occasional infections formal suture of nerves is seldom possible at the same time. Lysis is performed and if the nerves are severed ly is with simple approximation of the ends is done as a first stage procedure. Fibrin film has been used in several cases in the preparation of the bed for a subsequent formal neurovascular anastomosis.

Giving each man adequate care in a busy general hospital leaves little time for purely investigative research into the material at hand. Visualization of these arterial lesions by injection of diodrast (35%) is simple however and sometime may be of direct assistance in their care. Injection of diodrast may be quite innocuous but the observation has been made that fresh clot may be laid down in aneurysmal sacs following its use although no thrombosis in the vessels themselves has occurred (2). Figure 1 a and b (Case 16) shows x-ray pictures of an arteriovenous aneurysm of the femoral artery and vein with

basis of very convincing experiments advocates resection of a major vessel up to the next large collateral in order to obliterate a blind pouch with consequent arterial pressure dissipation. Figure 3 shows the collateral vessel to the gastrocnemius assuming a very essential function at operation this vessel was but a thread and upon the basis of the criteria mentioned might have been sacrificed. Classical main collateral channels are subject to so many anatomical variations (see Cases 6 and 7) that we do not believe that any vessel should be sacrificed. The size of the arterial branches can be very deceptive and spasm may completely conceal the importance of a vessel which is otherwise apparently insignificant.

The following case abstracts give only the barest essential data to illustrate the foregoing discussion

CASE REPORTS

CASE 1 J Z f l e u r y m of brach l artery
Rep ated external hemo hage thro gh sm ll punc
ture wound at lbow we contrlled by pr
D el pment of a pulsat g hem t m Eme ge ey
op rati n was done 2 w ks afte i j r y f r i creas
ns of the h matom Al it d n l n behi d
the b furcat on of the brach al t ry was t d
Rad l and ul ar p le w go d ft rward d
ma t ned Retu n d to d t 3 w ks

This is the only case in which simple suture was possible and feasible

CASE 2 A K fal n u y s m f p m p e f o s
b anch f pr f da f m s A large red ndurat d
mass f upp post o thigh d agnosed a ab ces
as op rat d pon 6 k aft wound g Asp
t on e led th t e tate f fars b thermo h g
a mm dit and d q i d co t o f
the fem lar arte y q ckly E pos e d l g at o
of sm ll p t lly t n s l w ed on Bru t w s
n t l t ened f p io t pe at on Un entful re
co ery

CASE 3 D M f lse neury m of ppl teal t ry
Hemo h g f m d b d d p p l e l w u d f r
n ted n n n al at h p t al from F c 3 day aft r
i j ry Ski r s p was co d rily clos d nd
pressu d es ing w applied Th e m e h m
rhages occu d du i g n e t 5 w l s with d el p-
ment of m nd brut Fu th bl d d m
ge ct pe af n was ca r d ut by Capt i J h
M cliv A p f r r ted fero al rty was f u d (t
ppl t l j n t o) thr ough and thr gh w nd
both h les pate Res t on f ju d p r t n d
l g at n we d Sympath ct my was d n n t

day because of certain calculations then use carefully

CASE 4 A J S f l s e a y s m f t h i d p o t i o n
o f x u l l r y t e r y k n a d i a l a d u l n a r p a l s e s
w i t h t y p i c a l p l t g m a s s p e s e t a u l l t h e
w o d w a s g r a n l i g P e s c o f b l o o d y d i s
c h a g w a s n o t e d o n t h e 2 6 t h d a y a f t e r j u r y a n d
w a s f a r e d t o b e a i g n f i t h a t t e n e d h e m o r r h a g e
O p t i w a s p e r f o r m e d t h a t d a y T h e n e r v e s
w e e d e t f i d (b o t h e e d) t h e s c w a s d i s s e c t e d
o t t d i s d P o s m i l g a t i o n w a s p e r f o r m e d
b e t w e e n a n t e r o a n d p o s t e r i o r c u m f i x h m r a l
v e s s e l T h e n e r v e s w e a p p o s m a t d C c u l a
t e t e d d u n g o p e a t i w a s a t s a f a c t o r y p o s t
p a t e l y P a t i e n t w a s s e t t o e o f i n t e r f e
r m a l n e r v e p a

CASE 5 H S f lse ane rrysm of xillary rt ry
Th was slo ncr ase i the s₁ f the infra
cular mass t first it was d gos d as a deep
ab ces ith r t i d foreign b dy Bruit appe ed
and pe t was p rform d 8 we ks ft r t i ry
Alth gh th radial pulse was good p rati was
not postpo d l g r b ca e of th ; crasing
p lys f the m d n and ul ar n rves A small
te n th a tery was fou d just pro imal t th
ju ction of the medi l a d lateral cords of the
b ch l plexus Th w s f ee bleeding from th
d t l e d of the vess l The t ry was di r d d l
l d t and segm t of n esect d Them d l
co d d ulnar n e ece badly to b t still m
cont nty Lv is f b th nerves was d e with fibrin
fibrin inse t b ut th m Co rse was ne e t f l
P t e t se t t zo f i t fo seco dary enc
p r

CASE 6 N F f ls anc rysm of femoral artery
A kno n fle a c rysm f th thigh was ntly ob-
servat on It b g t enla g s ddenly ndr pldly
2 mo ths ft c j ry Bed rest had bee m d
t ry bce s of oth j unies (fract es) Em r
ge cy cype at nud r t u niquet was n cess ry s
t met r t at a t ry j st p oimal t adduct r
ca al with y la g hem t ma cavity (2000 c.c.)
Artery and e w esect d l gat d Sympa
th ctomy w d en t day b cau of critical c
cul tion Th e s lle t warmth f foot 3 day
t s bseq ent co rse was u complicated

CASE 7 M M f is a c r y s m of femoral r t y
A k n w false s of thigh w d r b r a t i o
I c r a s e 1 z e was the sudd n w r t h d m n d
a n a l y s i s of f o t 5 w e e k s a f t r i j u r y E m r g n c y
o p e t i n w a s d e t p 7 c e n t u m t e t i n
t a t e r y j t a b v t h a d d u c t o r c a l w i t h 8 o o
c u b c e m t r c a t y B l k m o t b e s w
a d b l p h e o u s v n g m t w e m e d
o t n o t d b e c a s f t c h n i c a l d i f f i c u l t e E x e n
f j d e s e g m t w t h l i g a t w a s p e r f o r m e d
A c m p y n g e n w s e s c t d L y f c o n
d i t a l r v w a s c a d t C i r c u l t w a s
r o o d e c o r y u t f l

Cases 6 and 7 are similar both as to the location of the injury and clinical course up to

operation Note difference in circulation
after operation

CASE 8 D H false a rism of popl teal artery
 Ther wa a know fal e aneurysm in the poplite l
 space w th edema of the foot Sudden enla gemen
 f llowed an att mpt to get into a wheel chair 4
 weeks after injury Swelling was controlled by
 pressure but edema increased and the mass nlarged
 into th calf Emerg ncy operation was d ne 2 days
 lat r with l gat n and resection of a partly torn
 art y The vein vas resected and the contused
 tit l nerv lysed Sympathetic block 1 hour after
 ope tion (pntocaine used as spinal analges
 w ff) Crculation was good and there was a
 raj d s b d ce of the ed ma The wound was
 mod rat ly fected

CASE 9. S. V. fall a curysm of popliteal arte y
Th foot with v ry crtical culation was seen by
us 3 days aft r i ry it a cold pul e s th c lf
w s t se an d th r w e compl te paralysi and
a esthet c bove th nkle There was a bru
v r th poplit al pace No tre m nt as g en
in tra it f m the f e ch in asion to a sm il per
forat g poplit al u d Si ce there as sligh
blanching f th nail beds the leg was splint d nd
1000 cubic c nt met rs of blood g en Twelve
hours afte adm i na vere hemorrhage occur d
from the m dial ou d necessitating a tourniquet
(25 min tes) and cau ing sb ck Transfusio as
g g v n The foot was icy c ld blotchy nd the
calf st ny hard There was no bru Operation
d ne h rsl te (t bes n t a va lable until then)
sympath c my resect on of a length of saph ous
v i a d a ast mo s of the popl teal a tery to the
poster t bial over Blakemore tubes nd the v in
s gment bridg g a 3 centimet rd feet A funct o
i g chan l as btained No hepa n w ava l
abl Ly is of contused t b l nerve wa don a d
th wound parti lly clos d (Operati g tim 2 hrs
3 m n) There w sev al crtical days th g d
wa mth and color Seco d r y closu e f th w nd
as l e 7 day later Th e as a sligh t o z f om
th c nt al portion of the ou d n 4th d h ch
w th ght to be from the supe fici l t u s
No bru m s r f th r bleed g v s p e s t t
f ll p 4 eeks after operati o lat nt t
yet abl t l a foot d pend nt D d t st d
sh w d egment no f ct g n the th post
pe ti d y

(Th m le had str k artery at th b f cati
Th post r tib l h d tract d ben ath the gas
t o m m s Nothg was l f t fr t or tibial
c pt th n stop of t s f m th t r w ll
b h beca ull con ect l th post l h d
th es l n th t ch a dpre ted t f om r
t g Th str w thus f n g p g widly
at j t Th

CASE J B f l n u r y m f m e s a t c
 l f l t r v l p a t m y a d u t
 w t h t f t h h l i n t h l m d t t o f
 t t r o p e t l h m t m o o n f t w u l g t

front. A second laparotomy was done 1 week later at the same hospital for intestinal obstruction due to a Richter's type hernia. He developed severe abdominal pain 10 days after this on a boat in transit to the base. On admission he was 17 days after wound. The 1st laparotomy wounds were clean and healing. There were a thin and bruised over the 16 cm. incision in the abdomen pressing to the left of the midline. Spontaneous rupture occurred next day with deep shock and rapid progress toward a moribund state. Immediate laparotomy was done under local anesthesia. A large ill-defined sac was present within the mesenteric fat and died on the table despite massive blood transfusions. The site of the vascular injury was not found at postmortem examination.

CASE 11 G M p ogr ssly enlarging hema
toma of the r retroperit n l space There was a
sudden ons t f severe abd minal pain 2 ceks after
laparotomy at the front for a penetrating wound of
the abdomen Dagnosis f retroperitoneal hemor
rhage v as made but operat n was postponed be
cause of poor condition Laparotomy was done 2
days later Ther was a hug etroperitoneal hema
t ma on the r ght which on asp ration yielded dark
clotted blood N thr ll was felt The p ocess was
bel ved to be st to ary the abdomen was closed
There was pr gressive difficulty afte ope at on with
pain dte tion then hematemesis melena and
hemoptysis p to death At postmortem exam
inat on extensi n f the hematoma was seen t have
reached all mes teres and the v hole retroperi
t neal spac was gr atly ballooned out The re
sponsible vessel s not found

CASE 1. R M progressively enlarging hematoma of retroperitoneal space. The e was a penetrating oedema of the pelvis through the sciatic n tch. The abdomen was n t e p l red at front. Thr e c ks later a l rge mass was discovered palpabl both c t lly and abdominally accompanied by fe r symptoms of mild obstruction. A shell fragment t s centimeters n d diameter was present in th r a Lap r tomy w s done for a suspected abcc hch w s found to be a hematoma by aspi t n. The mass was opened transabdominally w thinned at p of e bleeding contr lled by pres ur n t h ght hypogastric ar ry. This es l was exposed d ded n d ligated. Th clot and foreign body w e rem d followed by recur e c of ble di g f om de p with n pelvis. Only contr l po ble as fibr foam and large gauze pack s k d n thr mbm. Th pack was left n for 5 days then rem d. There h d been no currence of h morth ge at 5 weeks.

CASE 3. W. D. a ten v n us an r ysm f
popt l a l a r y. At p cal art o n s aneurysm
f the popt l art artery with fist l into a subd ar y
d l l s e sac 6 centimet r s i diameter were
n ted. The was a brady card ac react on of o
beat per minute upon obliteration f the fistula.
Pat nt was allowed t be amb lat ry an l observed
f r 8 weeks. Elect e pair con l ted f e c n f

the sac a d f s t l a q d u p l i g a t a d e s e c t
of a e g m e t o f t h p l t l v e i S y m p a t h t c
b l o c k a s d o n e o f t e o p e a t o n C u r s
u n v n t f l F i v e m o n t h s f o l l o w u p f r m p t e n t
h i k i n g o m i l e s a d a y n t h u t d i f f i c u l t y C o m i n g
b a c k v r s a s

CASE 4 R C rte iovenous an urysm f the axl
lary artery a d v n A typical arte i ven le ion
with c 4 centimet rs in d mete p esented beneath
the clav cle Pat ent b rved for 6 e lsa d p at d
p n 2 m nths aft r j r y b a s f p ges i
uln pr lysi T a ectio dmed l et ction of
th n r two th d of clav cl (g vng e cellent e
p e with t r s ct f th b ne) pr x mal a d
d stal e pou e d n t l fves l dss t f
th sac fistula and plex thly is f th ul
ne e e d n E c o quad upel t ion The
clavicle w re it d by m ans of a 4 cent mete
l gh of K rschne i e f c d t the ma ro
cavities (const ct g sho lder d si g was d
s d postope ti ly) U e entf l c v ry Pa
tient s nt to zo c of t r becau e of s t d
jurie (ev re hemoth)

CASE 15 J A arter o en s aneu y m f p
ficial f moral t y and ve Pat t ente ed h
p l t 4 days after j ry w th d calf edem t
foot and b g n n g gr nou dem at n of toe
Th we e mall pu ct ou ds f both th
femo al and p l t al s no pl t Sym
pathetic blocks n t o oc as ns we e th ght to
have softe d the calf lightly An t e o
l n of th femo l es el s c ntum t s belo
Poupa t s lig m nt s d scov d by th pat nt 5
eeks after i ju y Sympathectomy was d e fol
l wed by xci of th istul nd qu d ple g
t n 7 d y s lat (N false) R c very w s
uneventf l The c rcul t n to the l r leg was
d finitely bette mmed t ly f llo i g clo e of
th fistul as th d al o b n fter ymphat t my
P or to vacu to mple guilotin amp tat on
j st ab v the kl s d It was felt that th
pe ti ns might hav aved po t n of th l
lg

CASE 6 W H t o a e ysm f the
 fmo al es l A typ call onv th th l g fl
 ll t d n Figu e Th we o symptom
 a d th sac was discov d q t acc d nt lly d r g
 a ut ech ck of p t t h le l w u d 3 m th
 ftr j y Symp th tomy was f llow d n 7
 d yd by mplt e c n i th and fist l d
 q ad pl l g t o Pat nt was lk g d v
 The les on was op rated up n th th ate b ca s
 of th l g of th fal s c d p s bility f
 pt

The remaining 6 cases of arteriovenous aneurysm were evacuated to the zone of the interior for treatment. Their lesions seemed perfectly stable and it was not justifiable to wait out the observation period overseas. The single patient with false aneurysm who was

TABLE I — ANALYSIS OF MATERIAL

T tal cas
 M j
 Mi ss l
 R t p nt l as
 A oc t d rv l ll m j as
 T tal mb p t d p
 H m h d tu
 N l s d cat
 E ly lect l tu t l ssel
 Gan
 D th (b th t p nt lgr p)
 A te y m
 T tal an ury m (e)
 M j scl
 Ass iat d rv l ns
 Numb p t d po
 F h m h
 F e
 F d ptur f ry
 T mp ural t d tally
 G r e (tabl h d dm)
 Death (unr l t d ban bac)

sent home unoperated upon had a subclavian lesion of small size which after a month's observation became even smaller.

Cases 1 4 8 13 and 14 have been previously reported in detail (3)

SUMMARY AND CONCLUSIONS

Observations on 30 patients with aneurysms (20 false 10 arteriovenous) are presented. On the basis of these cases the following conclusions are drawn:

The tendency of false aneurysms to bleed unexpectedly and profusely is so marked that in such cases operation should be carried out before evacuation to the zone of the interior even if a period of several months observation is required before ligation can be performed safely.

On the other hand patients with arteriovenous aneurysms are much more stable do not tend to bleed require a longer observation period and can be evacuated safely to the zone of the interior unless some indication exists for early surgery such as for example an additional large false sac or increasing nerve damage

Aneurysms of the retroperitoneal space are serious lesions and will require the surgeon's utmost skill to achieve success.

Aneurysms may simulate abscesses so closely that alertness must be practiced. Aspiration

should be done at the time of operation if any doubt exists

Classical channels of collateral circulation are extremely variable. No vessel however small should be sacrificed deliberately. Spasm may obscure the importance of an apparently insignificant arterial branch.

If any doubt of adequacy of circulation exists operative sympathectomy should be performed. Sympathetic block with novo-

cain is temporary and cannot be relied upon in all cases. It should be reserved for those instances only in which additional surgery can not be tolerated.

REFERENCES

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A S g 943 117 48
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Th at f Ope t 944 N 5
4 HO M F E S g Cy Ob t 944 78 75

PENICILLIN THERAPY IN ACUTE OSTEOMYELITIS

W A ALTEMEIER MD FACS d J A HELMSWORTH MD C c t Oh o

THE management of acute osteomyelitis has been unsatisfactory and the results uncertain. Diagnosis has been difficult and the disease has often been unrecognized until extensive destruction of bone occurred. Even when early diagnosis was made and surgical drainage instituted early a chronic suppurative process usually followed characterized by draining sinuses, sequestration, local formation of greatly thickened and eburnated new bone, soft tissue abscesses and recurrent acute exacerbations. Although the original infection became greatly attenuated in time, sinuses often persisted and discharged pus intermittently for years. Sequestrectomy or saucerization of chronically infected bone usually produced healing but offered no guarantee against recurrences. Too frequently the disease appeared to be cured only to flare up after a period of months or many years. The illness has been commonly seen in childhood and the chronicity of the process required long periods of treatment which removed the child from school and physical play. For these reasons and the uncertainty of the outcome, permanent personality changes became engrafted upon other sequelae of the disease such as limp, deformity or ankylosis of adjacent joints.

Chemotherapy with sulfonamides used in association with timed surgical intervention aided in the management but left much to be desired.

In March 1943 Florey had prophesied that one might anticipate the time when osteomyelitis treated early and intensively with penicillin would not require surgical intervention.

MATERIAL

During the past months we have observed the results of treatment in 34 cases of acute osteomyelitis with penicillin (Table I).

From the Department of Surgery, The Ohio State University, and the Ohio State General Hospital. This work described in this paper was done in the research laboratory of the Ohio State University, Columbus, Ohio. Received for publication, December 1, 1944.

In the group there were 23 cases of acute hematogenous osteomyelitis of the major long bone, some of which also had involvement of the flat bones of the pelvis. In addition there were 3 cases with infection of the pelvic bones, only 5 of the facial and cranial bones and 1 of the ribs. In 13 instances the process involved two or more bones simultaneously. The ages of 30 of the cases were in the first three decades of life illustrating again the prevalence of the disease in the young. Nine of the patients were females and 25 were males, a fact emphasizing the higher incidence of the disease in the male. The portals of entry of the hematogenous infection were apparently the pharynx or nasopharynx in 5 instances, furuncles or other localized skin or wound infections in 8 instances and unknown in the remainder. Two of the patients had diabetes mellitus, 1 had rickets in addition to the acute bone infection. The responsible etiologic agent was determined in every instance but 1 and was found to be the hemolytic *Staphylococcus aureus* in 29 cases, the nonhemolytic *Staphylococcus albus* in 2, the *Streptococcus hemolyticus* in 1 and the pneumococcus type III in 1. In 6 instances the nonhemolytic streptococcus was found in the pus in association with the hemolytic *Staphylococcus aureus*. Detailed bacteriologic examinations were made of the blood in all patients and of the pus in 21 of the cases. Positive blood cultures were obtained in 20 of the cases, the *Staphylococcus aureus* being recovered in 19 instances and the pneumococcus type III in 1. The nonhemolytic streptococcus was found in association with the hemolytic *Staphylococcus aureus* in 2 cases.

METHOD

The administration of penicillin was regarded as the primary treatment of each case and every effort was made to observe the full effect of the single agent before any change was made in the therapeutic regimen although it was not always possible to follow this procedure.

TABLE I—RESULTS OF PENICILLIN IN 34 CASES

N	Ag	Se	I n e i t i	I m	B r u				
					HSA	NHSA	HIS	NHS	P
		F	P tal	N	+				
		F	L fro l	Y	+				
3		M	L 6b l	N	+				
4		M	R f m L b d f b l	Y	+				
	5	M	L b	N	+				
6		M	R b	Y	+				
7	5	F	R f m L t	Y	+				
8	6	I	R bi 6 h b	Y		+			
		F	M d b l	N	+			+	
		M	L ac bul m L h m ru t m t	Y	+				
	5	F	P t m p o l d o c g tal	N		+		+	
		I	L h m ru	N	+			+	
		I	L f m and b l m	N	+				
		I	L pub isch m	Y	+				
5		I	R sac oul re	N					
6		M	R f m ac bul m R p l sch m	N			+		
7		F	R. bia	Y	+				
8	m	M	L f m	Y					+
		I	R. puls mus	Yes	+			+	
	mo	M	R 6 h d h t	N	+			+	
	8	M	L h m rus	N	+				
		M	R. bus l	N	+			+	
		M	M II	Y	+				
	5	M	L f m	Y	+				
1		F	L ace b l m j f m	Y	+				
		F	L f m L t m	Y	+				
		M	L b ru	Y	+				
		I	L l	Y	+				
		I	L b 6b l	N	+				
		I	R ba	Y	+				
		I	R l	N	+				
		F	L h ru	Yes	+				
		M	L b us	Y	+				
3		M	R h	Yes	+				

H A Hemoly S h koccus
N HSA sub molytic ph loeuccu bu
H I Hemoly reptococ
NHS unhemol ep ooc
Pare Pare molytic

Solutions of the sodium salt of penicillin in sterile physiological saline with a concentration of 5000 units per cubic centimeter were used in all but 1 case in which the calcium salt was employed. Care was taken to keep the solutions refrigerated at all times. The

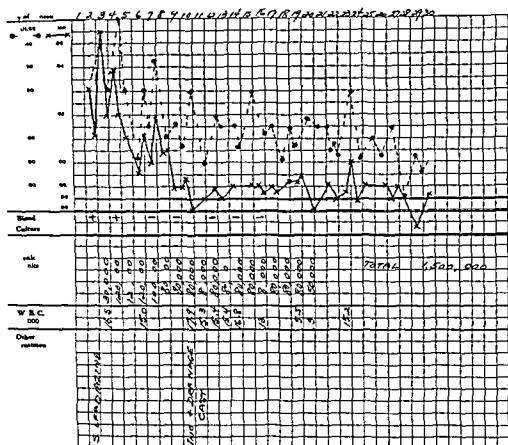
solution was administered by continuous intravenous drip in 10 cases and by interval intravenous or intramuscular injection in the remainder (Table II). The length of the interval usually was 3 hours but varied from 2 to 4 hours depending upon the severity of the in

TABLE II

Particulars					Summary			
No.	Dose	Route	Time interval	Total dose	No.	I & D	Ox co	Sequence
	5 000	T p i	hrs	5 000	-	-	+	
	5 000	I v i	h	5 000	-	+	+	
	5 000	I f	h	5 000	+	-	-	
	5 000	I v i m	hrs	5 000	+	-	-	
5	5 000	I m	hrs	5 000	+	-	-	
6	5 000	I v	d hrs	5 000	+	-	-	
	5 000	I v	C us drip	5 000	-	+	-	
8	5 000	I v	C us d	5 000	-	+	+	
	5 000	I v	Co us d	5 000	+	-	-	
	5 000	I v	Co us d	5 5 000	+	-	-	
	5 000	I v	Co us d	5 000	-	+	+	
	5 000	I v	Co us d	5 000	-	+	+	
	5 000	I v	hrs	5 000	-	+	-	
	5 000	I v	Co us d	5 000	+	-	-	
5	5 000	I v	hrs	55 000	+	-	-	
6	5 000	I v	C us d	6 000	-	+	-	
7	5 000	I m	hrs	6 000	-	+	-	
8	5 000	I v i m	hrs	5 000	-	+	-	
	5 000	I v i m	hrs	5 000	-	+	-	
	5 000	I m	hrs	5 000	+	-	-	
	5 000	I m	hrs	5 000	+	-	-	
	5 000	I m	3 hrs	6 000	+	-	-	
	5 000	I m i v	h	5 000	-	+	-	
	5 000	I f	hrs	5 000	+	-	-	
5	5 000	I v	C us d	5 000	-	+	-	
6	5 000	I v	Co us d	5 000	-	+	-	
	5 000	I m	hrs	5 000	+	-	-	
8	5 000	I f	hrs	5 000	+	-	-	
	5 000	I m	h	5 000	-	+	-	
	5 000	I f	hrs	5 000	+	-	-	
	5 000	I f	hrs	5 000	-	+	-	
	5 000	I f	hrs	5 000	-	+	-	
	5 000	I f	hrs	5 000	-	+	-	
	5 000	I f	hrs	5 000	+	-	-	
	5 000	I f	hrs	5 000	+	-	-	

fection duration of treatment and the supply of penicillin. The dose given by the interval injection varied between 5 000 and 5 000 Oxford units and the usual dose at the start of treatment was 15 000 units. In severe infec-

tion 25 000 units were given every 2 hours for the first 3 to 6 doses. In the patients receiving penicillin intravenously by continuous drip 30 000 to 80 000 units in 2000 cubic centimeters of physiological saline solution were



ig D g s () A t h mat g ost y lit f l f t m () Staphylococ eu
ba t

administered at the rate of 25 to 30 drops per minute. The dose was decreased when it was apparent that the infection was well controlled. In several of the earlier cases only 140,000 to 500,000 units were received as the total dose which should probably be considered an inadequate amount. Experience has shown that a dose of 1,500,000 or more units administered over a period of 2 or more weeks is a desirable dosage.

As small soft tissue abscesses developed they were aspirated with syringe and needle and partially filled with a solution of penicillin containing 5000 units per cubic centimeter every 2 or more days. In neglected cases with large abscesses incision and drainage was carried out after adequate preoperative preparation. In 3 instances topical application was effected by dressings saturated with penicillin.



J 0 944 Agu 15 944

Fig. B S Case 7

TABLE II

Penicillin Therapy					Significance of Reaction			
N	Dose	R	Time Interval	Total Dose	N	I & D	Os en	Sequelae
	5 000	I I	hrs	5 000	-	-	+	
	000	I V I I	h	00 000	-	+	+	
	5 000	I I	h	000	+	-		
	000	I V I I	hrs	5 000	+	-	-	
5	000	I I	hrs	5 000	+	-	-	
6	000	I V	d hrs	000	+	-	-	
	5 000	I V	Continuous drip	43 000	-	+		
8	000	I V	Continuous drip	00 000	-	+	+	
	000	I V	Continuous drip	000	+	-	-	
	000	I V	Continuous drip	000	+	-		
	5 000	I V	Continuous drip	000	-	+	+	
	000	I V	Continuous drip	60 000	-	+	+	
	000	I V	hrs	00	-	+	-	
	000	I V	Continuous drip	30 000	+	-	-	
5	000	I V	hrs	855 000	+	-	-	
	000	I V	Continuous drip	6 000	-	+	-	
7	5 000	I M	hrs	5 000	-	+	-	
8	000	I V I M	3 hrs	000	-	+	-	
	000	I V I M	hrs	20 000	-	+	-	
	000	I M	hrs	5 000	+	-		
	000	I M	hrs	000	+	-	-	
	000	I M	hrs	6 000	+	-	-	
	5 000	I M I V	hrs	000	-	+		
	000	I M	hrs	000	+	-	-	
5	000	I V	Continuous drip	000	-	+	-	
6	000	I V	Continuous drip	000	-	+		
	000	I I	hrs		+			
	000	I I	hrs	000	+		-	
	000	I M	h	000	-	+	-	
	5 000	I M	h	00 000	+		-	
	000	I I	hrs	00 000	-	+	-	
	000	I I	hrs	00	-	+	-	
	000	I I	hrs	000	+	-	-	
	5 000	I I	hrs	000	+			

fection duration of treatment and the supply of penicillin. The dose given by the interval injection varied between 5 000 and 2 000 Oxford units and the usual dose at the start of treatment was 15 000 units. In severe infec-

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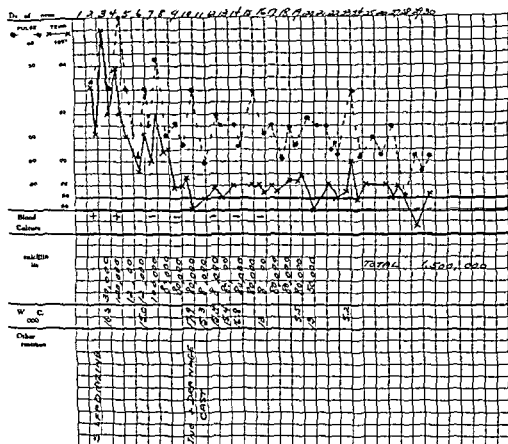


Fig. 1. Dose of penicillin in the treatment of acute osteomyelitis. () Staphylococcus

administered at the rate of 25 to 30 drops per minute. The dose was decreased when it was apparent that the infection was well controlled. In several of the earlier cases only 140,000 to 300,000 units were received as the total dose, which should probably be considered an inadequate amount. Experience has shown that a dose of 1,500,000 or more units administered over a period of 2 or more weeks is a desirable dosage.

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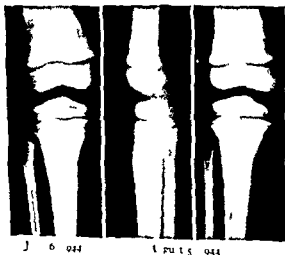


Fig. 1. B. S. Case 7

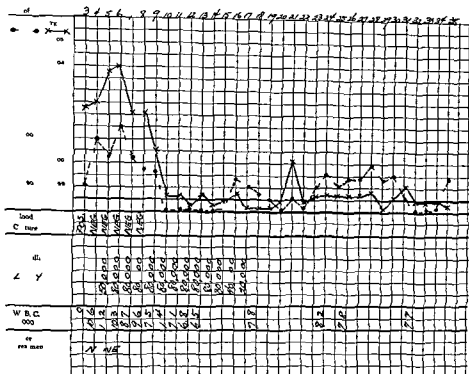


Fig 3 D g () A t h m t g t my h u f l f t f m () Staphylococcus

solution. In 1 case penicillin solution was also injected directly into the pericardial sac after that space had been emptied of its fluid accumulation by aspiration.

Plaster casts were applied in approximately one half of the case for contrast with those treated without immobilization. Twenty five of the patients had received sulfonamide therapy

before penicillin was started and the remainder had not. Penicillin and sulfadiazine were given concurrently in 9 instances.

The case records of 10 illustrative cases of acute hematogenous osteomyelitis of the long bones which were treated with penicillin are reported. They have been grouped for purposes of discussion.



J ly 944 J ly 9 944 A gust 944

Fig 4 W P Case 4

Ca 7 BS 4 ld ht gal as d
mtt d t th Chld n H pta lo Ju 5 944
T ow k b f h h d d l p d a b l s t r h r
h l w h b b a m f c t e d d d y b f e b
c m p l d f p i t h g h t l g d f Sh was
pl d g l s l f d th py d was
ll w d t tu hom Th ympt m e d
p g t ly q g h dm t th hos-
p t l

E m t n h w d d t y s ly ll ht
g l w t h m k d ll g t d r n e a d i c a l h t
b d b l w t h g h t k O th night heel
th was h l g f c t e d v e s b l
Th wht blood c t was 6500 c u l p cub
mill m t w t h 79 p c t p l y m r p h o n u c r l e u
c y t e s Th blood cultu w s p o s t f r th
h m l y t c St phyl coccu J ne 5 a d

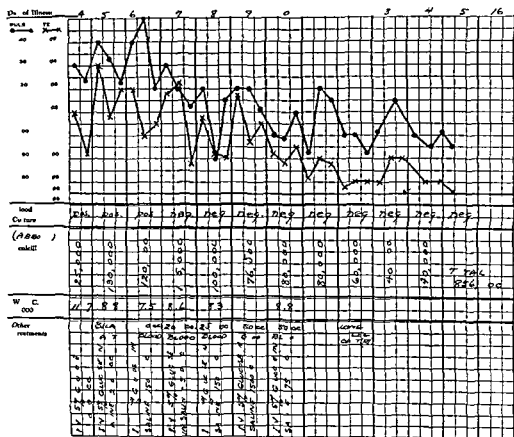


Fig 5 D gnosis () Acute hem t ost my lti (right f m d i f t b) St phylococcus
b t m (3) Staphylococc i p m m

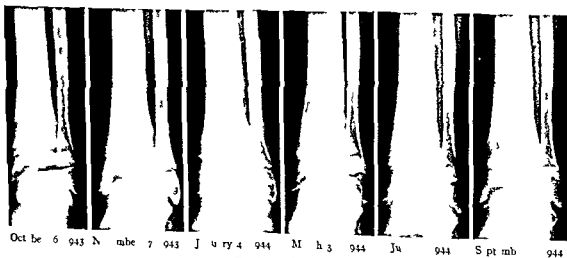


Fig 6 K M Case 4

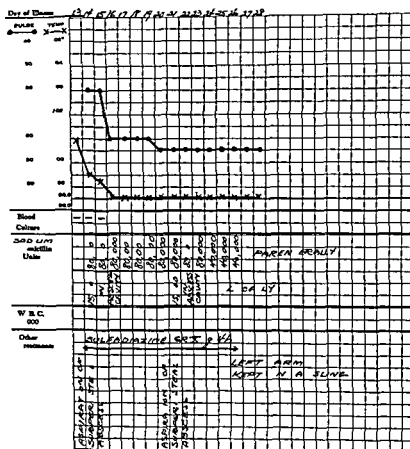
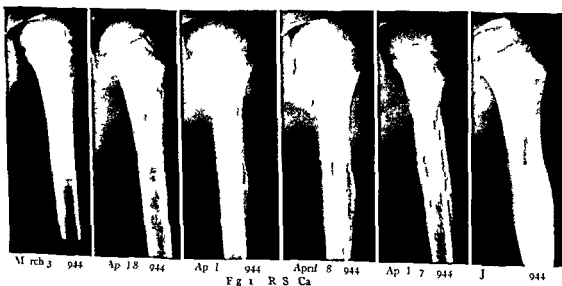


Fig 9 D on s A t h m t g teomy lts flth m ru th soft ti bscs



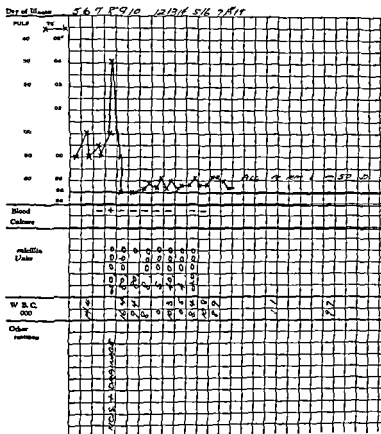
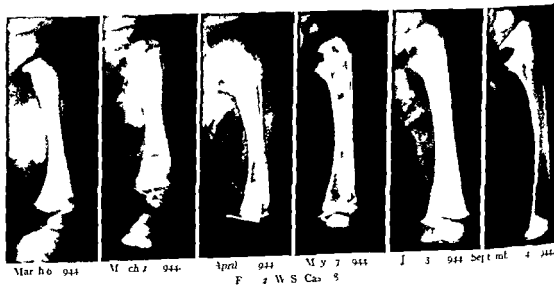


Fig. D. g. () A. t. h. m. t. t. my. lti. ff. m. () P.
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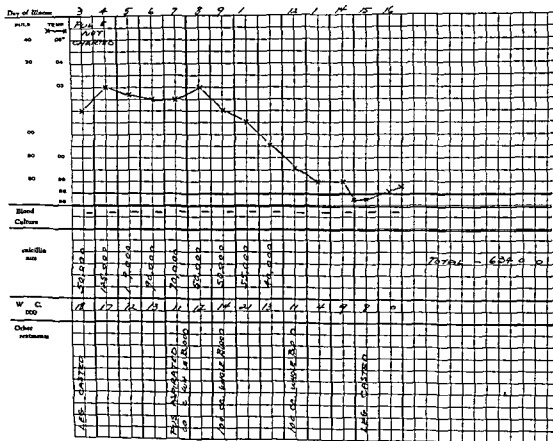


Fig 3 Act h t g t my ltu flft b d 5b 1

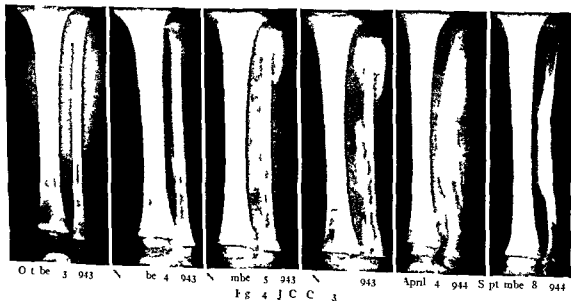
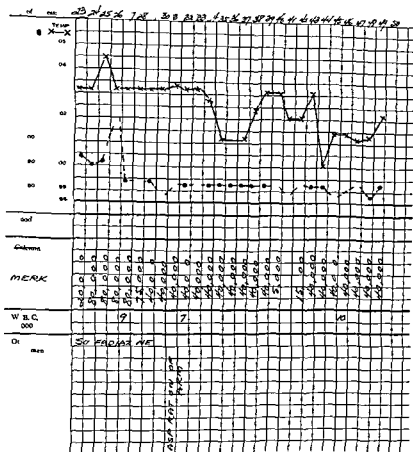


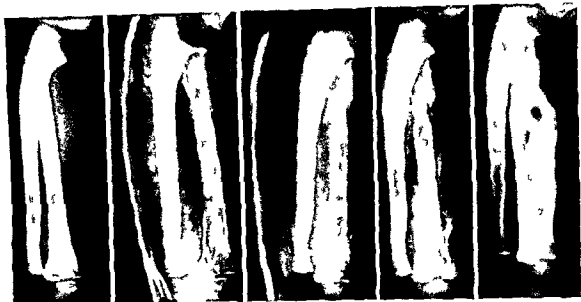
Fig 4 J C C 3



F 5 D on A t h m t t my h t f d d l n a

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a d l g m l l a f d m l t (Fg 4)
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I	o 1944	Jun 9 1944	J ly 8 1944	I ly 5 1944	O t b 7 1944
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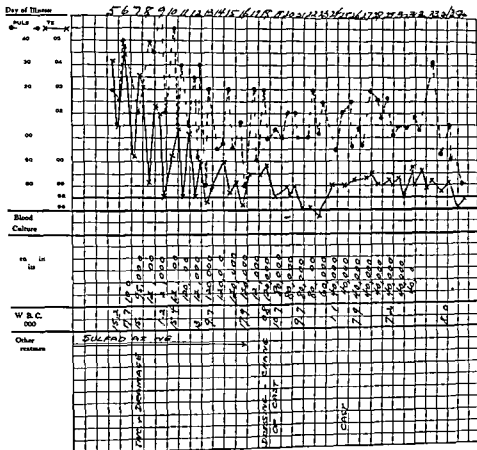
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July 7 1944 July 1944 August 8 1944 Sept 3 1944 Sept 3 1944

I g 8 G C C se 9

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I s a p a t d f m s f t s u e a b c e o e t h
p p l t r l a p c t f t h r m n d t h e m l y t c
t e p t c a c u l t e d f o m a t A t t h i m
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t m y e l t p o c s

nfection and 10 weeks before he had had epidemic meningitis from which he had made a complete recovery

Examination showed an acutely ill white boy whose temperature was 102.2 degrees F. There was a profuse nasal discharge. The left foot was red, hot, tender and swollen to a level above the ankle. A large vesicle containing blood-stained fluid was present over the area of greatest swelling.

The white blood count was 15,250 cells with 86 per cent polymorphonuclear leukocytes and the red blood cell count was 3,960,000. Urinalysis showed the presence of albumin and an occasional red blood cell. All blood cultures taken were negative. Roentgenograms showed swelling in the soft tissues but unfortunately they showed only a small portion of the leg.

A portion of the fluid in the large hemorrhagic vesicle was performed and examination of a stained smear of this material showed the presence of numerous small chain gram positive cocci. These were interpreted as streptococci and tentative diagnosis of hemolytic streptococcal gangrene was made.

Sulfadiazine 5 grains and an equal amount of bicarbonate of soda were given every 4 hours. Penicillin was started on the 4th hospital day, 10,000 units being given intramuscularly every 3 hours (Fig. 7).

The patient's condition became rapidly worse during the next 24 hours and it became evident that he would die before an addition of 24 hours. At this time it was learned that the culture of the vesicle fluid showed the Gram positive cocci to be the hemolytic *Staphylococcus aureus*. Immediate operation on the foot was decided upon. On the way to the operating room the child died of convulsions. Under ether anesthesia a long incision was rapidly made through the skin and subcutaneous tissues of the lateral and medial aspects of the leg and foot. A necrotic gangrenous infection was found in the subcutaneous tissues over the entire leg and dorsum of the foot. On the lower lateral aspect of the leg an area of slough with perforation was found in the fascia. The wound was loosely packed with gauze incorporating four Dickinson's tubes and the patient was returned to his room. A very poor condition. He received continuous oxygen therapy via nasal injection of 5 per cent glucose in saline solution and several transfusions of 5 cubic centimeters of fresh whole blood. Penicillin therapy was continued giving 15,000 units every 3 hours for the next 12 days and smaller doses at the same interval on 13 days.

The fever was striking improvement in his general condition which became evident within the first 4 hours. The condition during the following 7 days. The sloughs in the wound became replaced by healthy granulation tissue and the wound gradually healed. The patient was able to walk on the lower lateral aspect of the leg.

Roentgenograms 2 weeks later showed destruction of the distal ends of the tibia

and fibula and involvement of the tibioastragalar joint.

A leg cast was applied on the 21st day after operation and he was discharged on the 47th day. He was able to walk at this time and his general condition was very good. A small sinus tract was present and this could be traced down to the tibioastragalar joint. In October 1944 the patient began active weight bearing after removal of the cast. On November 23, 1944 the wound had completely healed and the patient was without complaint. Progress roentgenograms illustrate the healing which has occurred in the tibia and fibula (Fig. 18).

CASE 6. W. E. a 6-year-old white boy was admitted to the Children's Hospital; examination showed a large area of swelling on the right leg. The child had been made a diabetic 3 days later pain developed in the right knee associated with high fever and local swelling. On April 30, 1944 he had been admitted to the hospital for sulfadiazine therapy was started. When his general condition became progressively worse and the swelling in the leg increased he was transferred to this hospital. On admission the patient was found to be dehydrated, pallid, and cyanotic and dyspneic. White in the mouth condition. The oral temperature was 103.4 degrees F. Rales were audible in both lung fields. The right lower leg was dematioid red, tender and exquisitely tender. Several large areas of fluctuation were present in the involved area.

The white blood count was 37,850 cells per cubic millimeter and urinalysis showed only a faint trace of albumin. The blood leukocytes were reported positive for two myeloid cells of hemolytic *Staphylococcus aureus* to count.

The patient's condition was so desperate that it was obvious he could not withstand anesthesia or cyanosis and drainage of the soft tissue abscesses. Conservative therapy was started consisting of continuous administration of oxygen injections of 5 per cent glucose and saline solutions by continuous drip and transfusion of 200 cubic centimeters of fresh whole blood. After mobilized plastic splint was applied to the leg for immobilization. Penicillin therapy was started immediately 15,000 units being given intravenously every 4 hours for 4 days and every 3 hours thereafter. He failed to respond to this management and died 17 hours after admission. Permission for autopsy could not be obtained.

RESULTS

It is difficult to assess the value of a chemotherapeutic agent in a disease with both generalized and localized manifestations of infection and to determine accurately the result obtained in each case. Penicillin therapy in some instances of severe advanced hematogenous osteomyelitis with bacteremia sterilized the blood stream, saved the patient's life and

arrested the local infection yet the infection had already produced extensive bone necrosis. The general result obtained in such cases might be considered excellent or good but the severe local destruction of bone produced by the infection principally before the start of treatment with penicillin does not wholly justify this.

The mortality rate in this series was unquestionably lessened. Even though the group contained 3 cases of extensive acute osteomyelitis of the skull and 20 cases complicated by proved bacteremia or septicemia only 1 death occurred. A severe and neglected case of acute hematogenous osteomyelitis of the tibia with staphylococcal bacteremia and pneumonia was admitted to the hospital 14 days after the onset and died 17 hours later.

The results obtained in the cases of acute hematogenous osteomyelitis of the major long bones fell into four groups and varied with duration of disease, the onset and adequacy of penicillin therapy and the severity of the infection.

Group I If the correct diagnosis was made early within the first 3 or 4 days and adequate treatment was started immediately the results were truly excellent (examples Cases 17-4). After a period of 36 to 72 hours the fever, rapid pulse, bacteremia and other general signs of the severe infection began to disappear. At the end of a week the temperature was usually normal and the patient looked and felt quite well. The local signs of infection, such as tenderness, edema and redness, also began to recede after a similar latent period. In this group immobilization by plaster cast seemed to be of comparatively little importance and there was an early return of function. In fact it was practically impossible to keep some children off the involved extremities as early as 2 weeks after the start of treatment. Usually in this group surgical intervention was not necessary and abscess formation did not become evident.

The bone changes as depicted on the roentgenograms were minimal, consisting of localized periosteal reaction or small areas of patchy decalcification of the underlying cortex or both. These findings may be hard to see

and are easily overlooked. An additional 3 cases with typical symptoms and signs of acute osteomyelitis were not included in the report since it was impossible to prove the diagnosis in the absence of roentgenographic findings.

Group II When the diagnosis and treatment with penicillin were moderately delayed the general and local infections were brought under control rather promptly after a period of 2, 3 or more days during which little or no clinical response was evident (examples Cases 4, 5, 21). In this group local soft tissue abscesses occasionally developed but they were usually small. When small they were successfully treated by aspiration and local injection of a solution of penicillin at intervals of 3 or more days. If the abscesses were large, surgical drainage by incision was done to minimize further tissue destruction by the accumulated necrotizing bacterial toxins (Case 18). When surgical drainage was instituted the fall in temperature was usually prompt and not delayed for 36 or more hours as in the cases treated without surgical intervention (Fig. 11).

The bony changes developing in these cases were of great interest. Usually no change was visible on the roentgenograms at the beginning of treatment. After a week or more had elapsed periosteal reaction and localized patchy demineralization of the underlying bone became evident and progressively increased in extent and degree, becoming most marked 1 to 3 months after the onset of the infection (Figs. 6, 8, 10, 12). This process previously has been interpreted as representative of further extension of a chronic osteomyelitic process. Recalcification of the demineralized areas followed with re-establishment of a more normal appearance of the bone. Sequestration did not occur in this group.

Group III When the diagnosis and treatment were delayed for 7 to 10 or more days and when the infection was unusually severe, local destruction of bone became very great and soft tissue abscess formation and sequestration occurred in most but not all of the cases. The sequestration however was of limited extent and apparently in some cases the sequestrum acted like an autogenous bone graft.

The local infection was arrested with more difficulty in this type of case and longer periods of treatment with penicillin were usually required. Small abscesses were treated by aspiration and large ones by incision and drainage. Prolonged immobilization by cast in these cases seemed to be definitely indicated.

The bony changes as revealed by serial roentgenograms at the start of penicillin treatment showed extensive bone destruction which increased on subsequent examinations. Sequestration occurred in some instances. In Case 3 the sequestrum was partially discharged spontaneously and in Case 22 the sequestrum is still undisturbed. Small sequestra have apparently been absorbed spontaneously and larger ones possibly have acted as autogenous grafts. These bony changes and results to date are depicted in Figures 16 and 18.

Group IV In certain fulminating infections in which it is apparent that the patient will not live 48 or more hours to permit the maximum effect of penicillin surgical intervention after adequate preoperative preparation is still necessary as an emergency measure. Penicillin therapy is administered preoperatively and postoperatively in doses of at least 15,000 units every 1 to 3 hours. An example of this type is found in case report 29.

DISCUSSION OF THE VALUE OF PENICILLIN THERAPY

The principal bacterial cause of acute osteomyelitis is the hemolytic *Staphylococcus aureus* and less frequent etiologic agents are the nonhemolytic *Staphylococcus hemolyticus*, streptococcus, nonhemolytic streptococcus and the pneumococcus. Since these bacteria are sensitive to the action of penicillin it is not surprising that this chemotherapeutic agent has such a profound effect upon the disease. Sterilization of the blood stream and control of the generalized infection reduce the mortality rate and the incidence of metastatic or secondary infective complications. If metastatic complications such as staphylococcal pneumonia, pleuritis, pericarditis, thrombophlebitis, etc. already exist, penicillin is a powerful chemotherapeutic agent aiding in their control as an adjunct to surgical or conservative treatment as indicated. Thus morbidity is also decreased.

Of particular interest is the control of the localized infection and the resultant roentgenographic changes in the involved bone treated with or without surgery. During the period of penicillin therapy evidence of bone damage was absent or confined to minimal changes such as slight periosteal reaction or small areas of demineralization in the underlying cortex. After the cessation of chemotherapy the periosteal reaction and mottled appearance of the underlying bone progressively increased reaching a maximum 1 to 5 months after the onset of the infection depending upon the severity of infection. In this way the bone always looked worse a month or more after penicillin therapy than during it. This picture has been interpreted as being the result of spontaneous absorption of bone destroyed early in the infection and not as the result of continued destruction of bone by an extending chronic osteomyelitic process. Following this recalcification of the involved areas occurred often very rapidly. Meanwhile normal growth of the metaphyses, calcification of the adjacent epiphyses and early return of function occurred. These facts suggest that adequate penicillin therapy may sterilize the infected bone converting an area of septic necrosis to one of aseptic necrosis. If this is true it will necessitate our re-education in the interpretation of roentgen findings in osteomyelitis.

It has long been known that aseptic absorption of dead bone occurs in transplanted bone grafts (1). When bone is transplanted to another location a considerable part of it dies but those bone cells which are still bathed in lymph and body fluids continue to live and show marked proliferation in the course of a few days. Revascularization of the necrosed bone is accomplished by new vessels growing into the haversian canals from the surrounding tissues. Proliferating osteoblasts accompany the new vessel, giant cells appear and the dead bone undergoes absorption and conversion into a series of spaces lined by osteoblasts. The formation of new bone is then accomplished by these cells. In this manner the graft becomes partially absorbed and then replaced. We suspect that a similar process occurs in the dead bone in acute osteomyelitis treated adequately with penicillin.

Acute suppuration of adjacent joints subsided rather promptly leaving surprisingly little residual disturbance in the function of the joint.

Sequestration may still occur occasionally in acute osteomyelitis treated with penicillin but only when the disease is unusually severe the diagnosis is delayed or treatment is inadequate. If sequestration does occur further conservative therapy seems indicated. Extrusion of a sequestrum followed by complete healing of the sinus and an excellent result has occurred in this group. Further observations are required to determine the best methods of handling the sequestrum.

It is important to realize that no obvious clinical improvement may be apparent for a period of 48 to 72 or more hours after the onset of penicillin therapy in the patients treated without surgery. This is a very trying period during which considerable pressure may be brought to bear upon the surgeon by the pediatricians, internists or other surgical consultants in favor of immediate surgical intervention. Very close observation is required and a decision to operate may become necessary if the infection becomes so severe that the patient will not survive the 48 or more hours necessary for full penicillin effect. In the majority of instances however complicating or metastatic infections should be looked for if a sharp fall in temperature and marked clinical improvement do not occur at the end of this latent period. In the cases with large abscess treated by incision and drainage and penicillin the clinical response in this series was immediate.

Although this is only a preliminary report there seems to be little doubt that early and adequate penicillin therapy can eliminate the necessity of surgical intervention in cases of acute osteomyelitis. In the past there has usually occurred a considerable degree of secondary contamination of areas of osteomyelitis treated by surgical drainage. Devitalized tissue exposed to the air invites mixed or saprophytic infection particularly by various gram negative bacilli and it is often difficult to prevent this type of secondary infection. Secondary invaders have frequently been resistant to penicillin or even destructive to penicillin.

The elimination of this complication by penicillin therapy without surgery may be a very important factor in the arrest of the local infective process and the spontaneous absorption of devitalized bone.

Throughout the study and particularly at the start it took great fortitude to refrain from surgical drainage in individual cases as advised and even insisted upon by associated pediatricians, internists or consultant surgeons. In some instances surgeons unfamiliar with the action of penicillin were unwilling to complete the conservative treatment and performed local surgical drainage when we believed it was unnecessary. Later in the course of the disease when the roentgenological appearance of the bone became so bad it again became difficult to withhold surgery in face of reports that extension of the destructive chronic osteomyelitic process had occurred.

Since the local process in the bone is essentially one of diffusing infection characterized by purulent exudation, thrombosis of adjacent blood vessels and necrosis, the death of bone may become extensive if the infection is unrecognized or unchecked. In penicillin there is now available a chemotherapeutic agent which can check the infection and even permit spontaneous resolution of the osteomyelitic process. It is apparent therefore that early diagnosis and early intensive penicillin therapy are extremely important if the destruction of bone is to be minimized. It must be emphasized that early diagnosis can only be made on clinical ground and little or no help is to be expected from the roentgenograms for 10 or more days. If there is any doubt as to the presence of an acute osteomyelitis it is better to start penicillin therapy rather than wait until the diagnosis is proven.

The results obtained in some of these patients treated without immobilization were so good and recalcification was so rapid that the question of the value of immobilization by cast or splint should be studied further when penicillin is used.

SUMMARY

During the past 21 months 34 cases of acute osteomyelitis in which patients were treated with penicillin have been studied and a pre-

liminary report of the results has been presented. If the diagnosis was made early and penicillin treatment instituted promptly with out surgical drainage both the general and local infections were brought under control so thoroughly that a minimal amount of residual bony damage resulted. Moderate delay in diagnosis and treatment increased the extent of bony damage but the infection was nevertheless quickly arrested without the aid of drainage and without equicstration. If small localized abscesses developed they were treated very satisfactorily by aspiration followed by injection of a solution of penicillin. If large abscesses developed prompt drainage by surgical incision was required. Delay in diagnosis and treatment not only increased the degree of bony damage but favored the development of large abscesses sequestra and metastatic visceral infections.

A period of 36 or more hours after onset of penicillin therapy usually occurred before the

beginning of definite clinical improvement even in the cases diagnosed early. Occasionally cases of acute osteomyelitis are seen which are so fulminating that they will not survive the 48 or more hours necessary for the full effect of penicillin. Such cases must be recognized early during penicillin therapy and subjected promptly to the surgical procedure indicated.

Penicillin is a powerful and effective chemotherapeutic agent in the treatment of acute osteomyelitis. When administered early and in adequate amounts it reduces the mortality and morbidity, brings the infection under control, minimizes local destruction of bone and resultant deformities, permits spontaneous removal of necrosed bone and healing, and makes possible early return of normal or nearly normal function.

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THE TREATMENT OF INTRATHORACIC WOUNDS

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DURING the first year of our participation in this war the treatment of intrathoracic wounds was the subject of much theoretical conjecture since we had only the rather meager experience of World War I upon which to base opinions. In those years which have come between these two wars knowledge of pulmonary physiology and pathology has greatly increased. This knowledge coupled with proper anesthesia has made possible the safe performance of intrathoracic operations. Whereas such procedures were rare and accompanied by a high fatality rate previous to 1917 they now are commonplace and readily accepted surgical procedures. For these reasons it might be expected that thoracic wounds would be better cared for and that in the end the results would reflect these surgical improvements.

We have now been at war $2\frac{1}{2}$ years during which time we have engaged in several campaigns in a number of theaters. A large number of thoracic wounds have occurred but only recently have large numbers of this type of injury been seen and treated by individual groups. Thus sufficient statistics are now available to be of use in formulating some definite ideas on the proper management of such cases.

In order to understand well the opinions to be presented herein it is necessary to be somewhat familiar with the train of evacuation. In this theater surgery is done in one of three types of hospitals. The most forward of these is the field hospital which as a rule is set up beside the medical clearing station. Here auxiliary surgical teams work, and to these installations go the abdominal wounds, the severe chest wounds, and the traumatic amputations. Further to the rear are the evacuation hospitals which handle only recent casualties and still further back the general hospitals where surgery of a more definite nature is done.

A system of triage has been set up so that certain types of wounds go to specified general hospital. Such a system makes possible the evaluation of treatment and takes advantage of surgical specialists whom certain hospitals may have on their staffs.

This study is based on 320 cases of penetrating or perforating thoracic wounds seen during the winter and spring of 1944. The study has been divided into two groups, namely, those patients who have had a thoracotomy done in a forward installation for the purpose of debriding the intrathoracic wound and a second group of patients who have been treated by conservative and supportive measures in the forward area and were evacuated to a rear echelon hospital for whatever surgery of a more formal nature may have seemed needed. The first group contains 127 patients, the second is composed of 193 cases.

By this method of grouping, an attempt has been made to evaluate the merits of treatment in both echelons. Furthermore, a study of these statistics should give some idea as to when and where formal procedures should be done to give the highest percentage of good results with the least morbidity and fatality.

Debridement of the chest wall wound and closure of the sucking wound are accepted surgical procedures. The larger question is when should the debridement be carried to the intrathoracic area and in which of these injuries is it necessary to perform an early thoracotomy. Injuries to the contents of the pleural cavity which have been used as an indication for performing intrathoracic debridement are listed and will be taken up separately to determine whether or not they constitute an indication.

1 Wounds of the lower chest with possible injury to diaphragm and peritoneal contents

2 Foreign body, either metallic or bone fragments

- 3 Wounds of the mediastinum
- 4 Hemothorax
- 5 Tension pneumothorax
- 6 Hematoma of the lung

WOUNDS OF THE LOWER CHEST WITH INJURY TO THE DIAPHRAGM

There can be little question but that such wounds should be actively debrided and the debridement carried into the pleural space to determine the exact extent of the injury. There were 51 wounds of the diaphragm in this study. Forty nine of these patients had had a thoracotomy done in a forward installation with repair of the diaphragm. In 2 instances wounds of the diaphragm were overlooked. They were both on the right and there were accompanying wounds of the liver. Each of these patients developed a biliary pleural fistula with subsequent infection of a large overlying hemothorax. Bronchial fistulas were also present. Decortication of the lung with closure of the bronchial fistulas was done in each. In one an excellent result with complete expansion of the lung and removal of the tubes in 10 days was accomplished. In the other the bronchial fistula reopened, the lung collapsed, and a chronic empyema must be accepted.

The remaining 49 patients did extremely well when the gravity of these wounds is considered. As may be seen by examining Table I there were 10 wounds of the spleen requiring splenectomy and 4 wounds of the bowel which

were closed through the diaphragm. There were 14 instances of liver injury. In 1 patient the left kidney was injured and was removed through the diaphragmatic opening.

The ultimate results can be seen also in Table I. Twenty seven cases or 55 per cent could be called good results, the lung had expanded well leaving a relatively normal appearing chest. Six patients or 13 per cent had a fair result and in 16 or 32 per cent the outcome was poor. These 16 patients were operated upon for the second time to correct difficulties which arose following the first operation. Thirteen patients in this latter group developed empyemas, 6 who were considered to have an infected organizing hemothorax were treated by decorticating the lung, 7 were treated by rib resection and drainage of the empyema. One nonpurulent organizing hemothorax was decorticated. The remaining 2 patients had lungs which would not re-expand and a secondary thoracotomy with lysis of constricting fibrous bands was necessary. The empyemas were healed or healing when the patients were evacuated, and it is believed that none will require further surgery.

Those classified as fair results were so called because of a moderate amount of pleural obscuration in the lower chest, but it was felt that they could not be improved by further surgery.

There were no deaths although 3 patients had severe liver wounds. Each became deeply icteric and 1 had 4 severe hemorrhages from the liver before we were finally able to find the bleeding vessel and ligate it.

The spleen is readily removed through the diaphragm. In fact it is much more easily removed through the transdiaphragmatic approach than through an abdominal incision. It seems that in civil practice this approach may have distinct merit in the removal of the traumatized spleen as it obviates the dangers of a postoperative abdominal hernia and has the advantage of a much more complete exposure of the vessels. Furthermore individuals with a normal chest so operated upon can be out of bed in 4 to 5 days.

Left thoracoabdominal wounds did better than those on the right probably because of the complicating liver wound. A common

TABLE I—AN ANALYSIS OF 51 THORACOABDOMINAL WOUNDS

T me t und	N	F r e g e	Res l t m		
			Res l	N	P
Trea d b ho ac m		06	Good		
L ed (l)			F	6	
Wound f lee		6	Poo		
l und li			F b r g e r y d ne		
W d f bowel		4			
l d f k d e y					

l und li
l Bow l repa red thro u b d h r a m
k d e y (l) thro u g h d i b r a g m

cause of trouble in right sided wounds was neglecting to drain below the diaphragm after the repair had been done. If any suggestion could be made in the care of this type of wound it would be that whenever the liver is damaged the subphrenic space must be drained. This drainage we feel would obviate many of the difficulties encountered both above and below the diaphragm.

Early treatment by thoracotomy of the thoracoabdominal wound is imperative. One has only to witness the extensive complications which develop when these wounds are left uncared for to become cognizant of this point. It is extremely gratifying to see from these figures that of 51 such wounds only 2 were overlooked. Exploration is a sound policy whenever the course of the missile has been such that there is a possibility of injury of the diaphragm. Even though exploration may be carried out in the occasional case in which no diaphragmatic injury is present, still this procedure will save many individuals long periods of convalescence and in some instances their life.

METALLIC OR BONE FRAGMENT FOREIGN BODIES

There has been considerable discussion relative to the removal of intrapulmonary foreign bodies. During the African and Sicilian campaigns and for several months early in the Italian campaign a size limit of 7 millimeters was set as the criterion for removal. Naturally the location of the foreign body was an important factor when removal was considered. As time has progressed the limits of size were increased and at present only foreign bodies which exceed 1.5 centimeters are removed unless even though smaller their location makes their presence a menace to the host.

Some believe that a foreign body in the pleural space may be more hazardous to the host than one within the lung. In this series we have seen only 1 intrapleural metallic foreign body which was associated with an empyema. Apparently the fear is more theoretical than real. There was a tendency early in the campaign to remove metallic fragments from the lung in the forward installations. As time went on such practices were discouraged

for it was evident that no harm resulted from their temporary retention. Although foreign bodies are often surrounded by a hematoma of varying size into which have been carried fragments of clothing and other foreign substances in no instances have we seen a lung abscess develop nor do any of the authors have knowledge of such a happening.

In 26 patients in this study metallic foreign bodies were removed in forward hospitals by the performance of a thoracotomy. As nearly as can be told from records, which in a few instances due to the tactical situation were inadequate, the presence of the foreign body was the only indication for thoracotomy. In this group there were 8 poor results or 30.7 per cent.

In the total series of 320 patients admitted with penetrating or perforating chest wounds to our hospital there were 68 cases in which foreign bodies were present. In 2 the foreign bodies were considered too small to remove. In 2 instances patients having sizeable metallic foreign bodies were too ill from other wounds to consider removal and were sent to the zone of the interior with a foreign body retained. Forty-four patients had retained metallic fragments of a size which justified removal. Thirty-six of these had only a foreign body as an indication for surgery and were for purposes of comparison quite comparable to the group thoracotomized in forward hospital. In this group the only postoperative complication was 1 empyema or a poor result per centage of 7 per cent. In the remainder of cases the presence of the foreign body was not the only indication for thoracotomy. In 3 instances an organizing hemothorax was present and in 1 case the foreign body was complicated by an empyema. The 7 patients were treated by decorticating the lung with a good result in each instance. The 1 patient who had an empyema was treated with a rib resection and drainage and the foreign body was removed from the pleural cavity. The empyema healed and the soldier returned to limited duty.

It becomes plain from this tabulation of results that the presence of a metallic intrathoracic foreign body is not necessarily an indication for early surgery. It seems that

removal soon after wounding is accompanied by a certain degree of risk. When the poor results which ran to 30.7 per cent following early removal are compared with those of 2.7 per cent attained in cases in which a late and more elective thoracotomy was done it becomes clear that early removal is unjustified.

Bone fragments are not infrequently driven into the lung when a rib or scapula is comminuted in the process of wounding. Such fragments constituted an indication for early thoracotomy in 11 cases. The results were good in 7 instances and poor in 4. The reasons for classifying these 4 as poor results were as follows. In 1 instance an anterior thoracotomy had been done at the site of the wound exit. The wound of entrance which had fractured the scapula was not debrided. Four days later a subscapular abscess was drained. On admission to our service a lung abscess was present. At operation a long fragment of bone was found extending from the subscapular abscess to the one within the lung. We were of the opinion that the infection had traveled from beneath the scapula along the bone fragment to the lung where it had infected a hematoma. Two patients still had numerous bone fragments within the lung despite a thoracotomy for their removal. These cases were observed for some time and no trouble was seen to come from the presence of the fragments. The fourth case had an empyema with a large bronchial fistula. The lung was decorticated and the fistula closed. The ultimate result was classified as fair for while the empyema healed there was still a relatively large amount of dysfunction of the affected side.

Five times bone fragments were known to be present in patients who came to us without forward débridement of a formal nature. In 1 patient they were seen on the x-ray film and were left alone as there seemed to be no indication for their removal. In 4 patients they were an incidental finding at operation and subsequent review of the x-ray films failed to establish their presence. In 2 of these 4 cases a large bronchial fistula with an empyema was present and the bone fragment was found lying in the lung laceration. Whether its presence was the chief factor in establishment of the fistula cannot be said. It is conceivable

that when the fragment was set in motion by the wounding agent it could have badly lacerated the lung; however, it is equally true that the impact of the missile alone was sufficient to tear the lung parenchyma.

Certainly the case against early removal of bone fragments is not as strong as in the case of the metallic foreign body. There is some evidence to show that they may cause trouble of a serious nature. The neurosurgeons have considered them more dangerous from the standpoint of subsequent brain abscess formation than the metallic foreign body. However, the comparison is not entirely valid for the reparative properties of lung and brain tissue are entirely different. We feel that there are two reasons for avoiding a forward thoracotomy in these individuals. The first is that bone fragments are often exceedingly hard to find in a badly wounded lung when the hematoma is still present and the second is that early thoracotomy carries a higher percentage of poor results than those performed at a later period. A larger series of cases is needed to establish a policy consistent with good surgical principles.

WOUNDS OF THE MEDIASTINUM, HEART AND PERICARDIUM

The number of patients with wounds of this nature seen alive is by reason of their location relatively small. Seventeen such cases have been seen. Nine had had an early thoracotomy done. Of these 3 had wounds which had lacerated the pericardium. There was 1 stab wound of the heart with a cardiac tamponade which was repaired; the patient subsequently developed a purulent pericarditis which was drained and he made an uneventful recovery. In another patient the heart which had been lacerated by a piece of shell fragment was sutured and recovery was uneventful. Four times the mediastinum was wounded without injury to any important structures. In 2 patients the missile traversed the mediastinum and came to rest in the opposite lung from which it was subsequently removed. In 3 patients in this group there was electrocardiographic evidence of myocardial damage. The results which were obtained in these 9 cases were all good.

Eight patients were admitted to the hospital with foreign bodies in the mediastinum or pericardium. There were 5 instances of pericardial foreign body in the fragments were removed in 1 the missile was extremely small and was left in place. Five patients had mediastinal foreign bodies of varying size. One which was extremely small was not touched. The remaining 4 were operated upon. The foreign bodies were found in 3 in 1 the missile was never located. The postoperative course was uneventful in each case.

Early thoracotomy should undoubtedly be done in those cases in which the posterior mediastinum has been wounded because of the possibility of esophageal injury. For practical purposes the esophagus is the only important mediastinal structure the wounding of which if not followed by early repair may give serious results.

It would seem relatively safe to leave fragments in the anterior mediastinum for subsequent removal. Pericardial lacerations should be repaired but it is often difficult to tell just when the pericardium has suffered. Cardiac tamponade resulting from cardiac laceration requires immediate surgery.

In wound of the mediastinum as in those of the diaphragm the wound of entrance and the course of the missile will have much to do with determining whether early surgery should or should not be done. If there is any question as to the possible damage to important structures early surgery is the only course in keeping with good practice.

HEMOTHORAX

Hemothorax is seen in a large percentage of chest wounds. In civil practice there have been two schools of thought namely those who did nothing with the blood within the pleural space and those who felt it should be removed by aspiration. From reports of these two methods of treatment the results seen ed always good. It is true that patients seen in civil life by the authors and treated by aspiration alone did well and thoracotomy in such individuals was rarely done. When a aspiration was done and the blood was removed the lung promptly expanded. The presence of residual obscuration of the lung on x ray

examination was rare and recovery was almost invariably rapid and complete. This has not been true in all cases of hemothorax seen here. Often within a few hours after wounding it was impossible to obtain any blood from the pleural space despite x ray evidence of fluid. The answer was that the blood had already clotted. Such a situation led to the performance of early thoracotomy to remove the clot and suture the bleeding lung for it was felt that early removal of the clot would speed recovery. As time went on it was realized that so simple a solution was not the answer to a problem which constantly gathered to itself more complications.

In this study there were 31 early thoracotomies done for hemothorax alone. The blood within the pleural space was not clotted in all instances. From this number of thoracotomies only 10 or 32 per cent could be called good results of the remainder 3 or 9.8 per cent were considered fair results and 18 or 58.0 per cent were definitely poor.

The 3 cases classified as fair were so called because of moderate pleural obscuration by x ray examination. There is some question now on reviewing these films as to whether subsequent surgery should not have been done in 1 of these but our early opinion was that the lesion would clear. This it did moderately well however we feel now that in the present state of our knowledge of such things the lung should have been decorticated.

The 18 cases tabulated as poor results were so classified because of the following reasons. Fourteen patients subsequently developed empyemas. Seven of these were treated by decorticating the lung on the involved side. 7 had a rib resection with drainage of the pleural cavity. Most of these "hows" were treated by drainage alone would now be decorticated because they represented infected organizing hemothoraces however they were seen early in our experience they were localized empyemas and it was felt safer to treat them by simple drainage. Three patients who had an organizing hemothorax were operated upon and the lung on the involved sides were decorticated. One patient had an organizing hemothorax of a mild degree and because of other wounds which complicated the situation no further

surgery was considered wise. His course was afebrile and the need for immediate surgery was not considered urgent.

Eight of the 17 patients operated upon had completely expanded lungs at the time of discharge. Nine still had an empyema tube in the pleural cavity. Two of these 9 had a large bronchial fistula in a small empyema pocket. They will probably need further surgery. The remaining 7 had small empyema pockets which were obliterating.

One hundred and nineteen patients with hemothorax who had had no previous treatment other than debridement of the chest wall wound and aspiration of the pleural cavity were admitted to our service. Seventy six or 63.8 per cent of the group cleared completely or almost so by aspiration alone. Four patients who had a moderate amount of pleural exudate but not enough to require further surgery were called fair results. Thirty nine or 32.9 per cent failed to clear. In some of these aspiration had never been possible and in others it was possible to obtain fluid early while later attempts at aspiration gave negative results despite evidence of fluid by x-ray examination. Nineteen of the 39 cases of organizing hemothorax were grossly infected and must be considered empyemas.

The 39 patients who failed to clear by aspiration alone were subjected to further surgery. In 30 instances the lung was decorticated. 10 patients in this group had gross evidence of infection at the time of surgery. The remaining 9 cases were treated by rib resection and drainage of an empyema. Twenty seven of the 30 patients whose lung on the affected side was decorticated obtained good results. 3 had a poor result. Two of the group will have a chronic empyema and will need further surgery. 1 has an empyema which is slowly expanding and because of the progress made under our observation we feel the lung will completely expand. In 9 instances in which a frank empyema was present and rib resection with drainage was the procedure used good results with the complete expansion of the lung were obtained in 7. One patient had a large bronchial fistula and will require further surgery. The remaining patient had an empyema which was diminishing

rapidly in size when he developed a brain abscess approximately 3 weeks after drainage and died.

The question may arise in the minds of some as to when simple drainage of an empyema is resorted to and when the lung is decorticated. This subject will be discussed more fully in a subsequent communication. To state the problem briefly we have decorticated those who had evidence of an organizing hemothorax which was known to be partially infected but in which liquefaction of the clot was proceeding slowly. We have drained those who had a small localized empyema in which we felt that the lung was expansible and the fibrin peel had been completely liquefied. With the advent of penicillin as an adjunct to surgery and a better knowledge of the surgery involved decortication is considered a more useful procedure than open drainage in such cases for it allows the patient to have an expanded lung more quickly, it obviates the wearing of an empyema tube for a long period of time and reduces the incidence of chronic empyema.

To summarize these cases it will be seen that of 119 patients with hemothorax who were not thoracotomized early 110 or 92.4 per cent had a good result, 4 were classified as fair, 4 as poor and 1 died. These figures should be compared with the results obtained in the group who had an early thoracotomy for hemothorax where the percentage of good results was 32.2 per cent and the poor results ran to 58 per cent. There were 19 empyemas in a group of 119 patients treated conservatively early as compared with 14 empyemas in 31 patients who had an early thoracotomy.

It may be said that these two groups are not entirely comparable and that is granted. However if the 39 patients who ultimately came to surgery late are compared with the 31 who had early thoracotomy the comparison is still striking: the good result percentage in the first group being 87.1 per cent as compared with 32.2 per cent in the latter. Furthermore 17 of the latter group subsequently underwent further surgery for either an empyema or an organizing hemothorax.

The argument has been raised that thoracotomy has been done early to stop lung

bleeding Lung bleeding is a transitory thing as is evidenced by the fact that in only 1 case of 17 upon whom forward thoracotomy was done was a bleeding lung seen. With the collapse of the lung which comes as the hemothorax increases the bleeding stops. Intercostal vessels have been seen to bleed more often than the lung but these can be controlled in the original debridement by removal of a small segment of rib and ligation of the vessel. The pleural cavity need not be violated.

There can be no question but that hemothorax as we see it here presents an entirely different picture from that seen in civil practice. The method of wounding is of course different. In civilian experience the wounding agent is as a rule a pistol or rifle bullet of small caliber or a sharp weapon of small size. The majority of these wounds discussed here were produced by shell fragments which have rough edges which whirl in their passage and do great trauma to the tissues through which they pass. It is not uncommon in these wounds to see the tissues contused and bleeding for some distance from the path of the missile. Severe hemothorax has been seen in instances in which the wounding missile never entered the pleural space. The dissimilarity in the wounding agents may account for the difference in the behavior of hemothorax here and at home. While there still may exist doubts in the minds of some as to the cause there is no question that a marked difference exists. From our figures it seems evident that approximately 30 per cent of hemothoraces treated conservatively will need subsequent surgery. However there is little question but that such a method of treatment gives infinitely better results than can be obtained by early thoracotomy.

TENSION PNEUMOTHORAX

Strangely enough pneumothorax of a tension type has not been a serious complication in these wounds. Tension pneumothorax can arise in two ways from an external wound which sucks air in but will not release it or from a lung wound which pumps air into a pleural cavity from which there is no avenue of escape. In talking to recipients of these wounds it is clear that the average soldier as

soon as he hears the wound suck applies pressure with his hand or lies on the wound until the aid man who promptly applies a pressure dressing arrives. These two things have tended greatly to obviate the dangers of the sucking wound. Tension pneumothorax from the wounded lung has not been common. When seen it has been treated early by aspiration. If this has failed to keep up with the air escape a catheter is placed in the chest at the field hospital. In only 2 instances was an early thoracotomy done to close what was apparently a large lung laceration with tension pneumothorax. In both instances catheter water seal drainage had not controlled the pneumothorax. Such a procedure seems entirely justified in a wound in which catheter drainage after a reasonable length of time has not brought about lung expansion.

Subcutaneous emphysema which has been the nightmare of older surgeons ended in treating the wounded has been seen only rarely in a degree to which it presented a problem. There is often a small amount of air in the tissues about the wound but in only 1 case in this series did an emphysema of a serious nature develop. Why have these two conditions namely tension pneumothorax and extreme degrees of subcutaneous emphysema which we worried greatly about during those days when we were preparing for combat turned out to be of such minor importance? It seems that the establishment of the hemothorax with a small amount of pneumothorax quickly collapses the lung with the result that both bleeding and air escape cease. These lungs collapse quickly and uniformly because there are no adhesions to hold them to the chest wall. By such a mechanism the wounds are quickly sealed. It must be remembered that we are dealing with young individuals who have been carefully screened by history and by physical and by x-ray examination to rule out pulmonary disease. This explanation is also not entirely theoretical for in over 200 thoracotomies which are included in this series in only 3 cases were adhesions present which bound the lung to the chest wall. Furthermore x-ray films taken soon after wounding show that adhesions are only rarely present. It may therefore be said that x-ray

TABLE II—TOTAL RESULTS FORWARD THORACOTOMY

	Good		F		Poor		T	F + P
	N	P	N	P	N	P		
W d ds phr get	7	55	6	3	6	3 6	9	6
F gn bodi	7	65 1		3 6	8	3 7	26	8
H m thora				8	8	3 3	3	8
Bon fragmen		6 6			3	3		
Ten m b						5		
W d, medi, ab m	6	75				5	8	3
T	6							

screening on induction has played a part unthought of at the time of its inception

HEMATOMA OF THE LUNG

Hematomas of the lung may result from wounds of the lung or from the contusion which occurs when the chest wall is wounded without pleural penetration. We have seen 1 hematoma which involved over three fourths of the upper lobe result from a wound which transected the spinal cord and furrowed through the shoulder girdle on its way out. There was no pleural penetration.

Hematoma has presented no problem. As a rule they clear almost completely in from 1 to 4 weeks depending on their size. On 3 occasions we have seen the hematoma break down and leave a round cyst like cavity which upon further observations closed leaving a normal appearing lung. One of these patients had a fluid level and coughed up old blood for some days the temperature remained normal and recovery was complete. Purely on the basis of theory one might expect abscesses to develop in these ideal sites. We have seen but 1 case in which an abscess developed and thus we feel was infected from a bone fragment which communicated the hematoma with an extra pleural abscess.

Large metallic foreign bodies have been seen lying in the center of hematomas and have caused no trouble. We have come to feel that it is best to let the hematoma resolve before removing the foreign body the reason for this belief being that it would be necessary to evacuate the hematoma to remove the missile. Such a procedure leaves a large defect in the lung which must be closed by wedge resection.

Early in our experience such problems were encountered. If the hematoma is allowed to resolve the foreign body can be removed by simply incising the lung. It is then removed through normal tissue which can be closed with a few fine silk sutures. It is remarkable to see how normal these lungs are a few weeks after wounding.

The lung has remarkable ability to heal. We have seen lungs which aside from an organizing hemothorax were otherwise normal which only a few weeks previous had been so badly contused that the surgeon had considered lobectomy. It is important to remember that a lung which a few hours after wounding may appear hopelessly damaged will be almost normal in appearance a few weeks later.

DISCUSSION

We wish to make clear that the comparison of the results of forward installations with our own is in no way an attempt to depreciate the work of those who see these injuries early. It is rather an attempt to learn what is best treated early and what is better treated late. The problems met here have not been met before and it is only by such candid analysis of failure and success that we can come to conclusions which will aid our efforts.

In all 17 patients with thoracotomies done early have been compared with 193 treated conservatively early definitive treatment being left until later. The results of the first series are as follows: 63 cases or 54.3 per cent are to be considered good results regardless of the indication for which they were done. 11 or 7.9 per cent were fair results and 48 or 27.8 per cent were poor. It was necessary to do opera-

tions of a secondary nature in 48 of the 127 patients mentioned. This figure represents 27.8 per cent of the total. Seventeen empyemas were drained. 1 lung was decorticated for an organizing hemothorax with or without an associated empyema. 3 foreign bodies were removed and 1 lung abscess was drained. Five patients had a lung which would not expand and needed a subsequent thoracotomy with lysis of adhesions to aid re-expansion. One large chest wall defect was closed.

These results can be compared with those obtained in 84 thoracotomies done on this service in 1944 of which the operative procedure was their second thoracotomy. There were in this group 66 good results or 78.5 per cent, 12 or 14.2 per cent fair results and 6 or 7.5 per cent poor results.

It becomes evident from these figures that early thoracotomy does not give the good results which can be expected from thoracotomy done late even at times for complications which were more serious than the original wound. It has been the experience of those in this theater that early thoracotomy will at best give about 50 per cent good results.

There are certain reasons for this, some of which are avoidable and others not. It seems to us that most of the poor outcomes encountered can be attributed to failure of the lung to expand on the side operated upon. One as a rule has little trouble with subsequent empyema following surgery if the lung rapidly expands to fill the pleural space.

These thoracotomies were done in many instances on badly wounded lungs. In such cases a hematoma may be present and the lung may show other pathologic states such as edema and patchy atelectasis. Such states prevent proper expansion of the lung. Numerous fine moist rales and rhonchi are a common finding in these individuals. This condition has been called *wet lung of trauma*. Great care has been taken by our forward surgeons to perform bronchoscopies after all thoracotomies but bronchoscopy while a definite help clears only the large airway obstruction. Therefore a situation arises for which little can be done except to avoid thoracotomy in any case in which it is not a necessity to preserve life and lessen later complications.

Hemothorax develops early and is often clotted at the time surgery is done. There is already a fine film of fibrin deposited on the lung surface which definitely impedes expansion. When this lacework of fibrin has been deposited it is almost impossible to remove it at this early stage. Thus the lung expands poorly because of the fact that it is wet and as it dries it is held in the unexpanded state by a coat of fibrin which gradually becomes heavier.

There is still another factor that may have some bearing on the behavior of some of these patients. The large majority of these cases were seen during the winter of 1944. It was cold along the Rapido and before Cassino rain fell frequently in the low lands and in the mountains which flanked the valleys snow fell. There was little shelter, many of the troops had respiratory infections. Evacuation was difficult because of the terrain and wounded men often lay for long periods before they could be removed. This combination certainly increased the hazards of a wet lung or laid the groundwork for it.

There have long been two schools of thought as to the advantage of draining the pleural cavity after surgery. We were impressed with the frequency with which the thoracotomies were closed without drainage. To us it had always seemed that water seal drainage for a period of 48 to 72 hours after intrathoracic surgery had distinct advantages. In this group no drainage was used in 37 cases. A comparison of the good and poor results from the drainage standpoint is enlightening. In 90 patients who had thoracotomy and were drained the results were good in 60 per cent of the cases. Whereas in 37 cases in which drainage was not done the results were good in only 35.1 per cent. Such results lend credence to the belief of a large number of thoracic surgeons that drainage of the pleural cavity after intrathoracic surgical procedures has virtue. This fact it seems is doubly true in these types of injury in which rapid lung expansion is a prime factor in the avoidance of empyema.

There were 54 patients in the entire series of 320 who developed an empyema or an incidence of 16.8 per cent. Empyema occurred in 34 of the 127 patients who had early

thoracotomy or 63 per cent. There were 20 cases of empyema in 193 patients treated conservatively early. The incidence of empyema in these patients who had an early thoracotomy, done is lower than has been the experience of some other groups in this area. The reason for this we do not know unless it be that when an organizing hemothorax was present we adopted a policy of early decortication of the lung. Early in the Tunisian and Sicilian campaigns it was not uncommon to see in individuals who had an organizing hemothorax develop empyema in from 6 to 8 weeks after wounding. It is our experience that a very high percentage of organizing hemothoraces are infected as demonstrated by positive cultures of the peel even though the clinical course would belie it. Thus early removal of the peel may have obviated the development of an empyema in a number of our cases. We have adopted a policy of decorticating these lungs from 3 to 4 weeks after wounding. Earlier attempts find the peel too friable to be consistent with good removal.

There were 6 patients in the entire series who we believe will need further surgery to restore them to normal beings. Four of these have unclosed bronchial fistulas, 2 have a moderately large chronic empyema. Empyemas which have developed on the basis of an infected hemothorax in our experience and in that of others have often become chronic. Decortication of the lung in these cases has been of great aid in preventing the occurrence of chronic empyema. Sixty one of the total series returned to full duty, 104 returned to limited service which included all types of duty except combat. Sixty one were sent to the zone of the interior because of the severity of their chest wounds. Ninety were sent to the zone of the interior because of other wounds, their chest wounds were healed and would not have hindered their return to full or limited service. Thus of 320 penetrating or perforating chest wounds 255 were able as far as this type of wound was concerned to return to full or limited duty.

There were 4 deaths in the entire group or an incidence of 1.2 per cent. The causes of these deaths are as follows. One patient who had had an early thoracotomy for a hemothorax

and who had an excellent result developed a pulmonary embolus 20 days after operation. One patient who developed an empyema following a hemothorax and who was treated by open drainage died approximately 3 weeks later of a brain abscess. The third patient was admitted in extremis 3 days after wounding with a hemopneumothorax and a transverse myelitis at the 4th dorsal. A catheter was placed in the left pleural cavity. He failed to improve and died within 10 hours of admission. The fourth patient was admitted approximately 10 days after a severe chest and abdominal wound. An abscess was present in the left upper lobe and a peritonitis with a paralytic ileus was present. Decompression with a Miller Abbott tube was done. Three days later the abdominal wound disrupted. This wound was repaired but death occurred 4 hours later.

When the number of complications which arose in this series and the severity of wounds are considered a group of 6 patients is not too great a number to return home for further surgery.

We feel that a number of factors have made such results possible. In the last war one large factor in the invaliding of large numbers of soldiers was the presence of a chronic empyema. Decortication of the lung while an old and discarded procedure has in many instances in this series spelled the difference between a relatively normal chest and a chronic empyema. In fact in the group of empyemas cited here several were 3 months old and chronic when we first saw them. Their lungs were decorticated and they are now well.

Early intrathoracic débridement in the thoracoabdominal wound has without doubt saved many lives. It restored the integrity of the respective body cavities which had been destroyed by wounding. Many of the patients mentioned would have surely died had it not been for the early and adequate care which they received.

It becomes clear that hospitals are very necessary near the lines. It is also clear that the personnel of these installations must be well trained surgical specialists in order to be able to cope with the heavy and intricate problems which face them. It is distinctly a

credit to our Army that the man power and materials have been made available in these places. If lives are to be saved it is necessary to have forward installations with men and equipment capable of restoring deranged physiology. It is likewise necessary to have farther back centers containing suitably trained surgeons to care for the pathologic conditions produced by early injuries. Such advantages we have had and to us the results here tabulated reflect it.

Chemotherapy has been used when it was thought to have virtue. In the patients operated upon by us the sulfonamides have been used but rarely. The bacteria encountered were known to be resistant to this type of therapy and therefore no good reason could be seen for their use. Penicillin was available in large amounts only during the last months of the time in which this work was done. It is our present feeling that it has been of distinct aid but because of lack of an adequate comparative series our ideas are still not fully crystallized. Undoubtedly the greatest factors have been the adequate replacement of blood loss and careful surgery. Before extensive restorative procedures are undertaken the blood picture should be as near normal as is possible. This may mean waiting a few days. At times as much as 3,000 to 4,000 cubic centimeters of blood are given. We have found that the delay in these cases is well worth while.

Proper anesthetics administered by well trained physicians and nurses have been of great value. Intratracheal nitrous oxide gas, oxygen and ether anesthesia has been routinely used. It is evident to us that much of the work could not have been attempted had not excellent anesthesia methods been available.

These results we believe reveal that lung wounds properly treated can and do give encouraging results. They also indicate that

definite surgery should be done whenever possible in the theater because of the high percentage of patients capable of returning to some form of duty.

SUMMARY AND CONCLUSIONS

1. Three hundred and twenty cases of penetrating or perforating wounds have been observed and the results of treatment recorded.

2. The results of early definitive surgery have been compared with delayed definitive surgery.

3. Fifty-four empyemas developed or an incidence of 16.8 per cent.

4. Sixty-one patients returned to full duty, 104 to limited duty in this theater, 90 were returned to the United States because of wounds other than the chest wound which was healed and would not have hindered return to full or limited duty. 61 were returned to the United States because of their chest wound, 4 died.

5. Six patients will need further surgery to obliterate a chronic empyema, 4 of which had an accompanying bronchial fistula.

6. Hemothorax is best treated by early aspiration if clotting occurs and organization takes place. Decortication of the lung should be done.

7. Early thoracotomy for clotted hemothorax does not obviate the possibility of a later organizing hemothorax and the percentage of empyemas is higher than in the conservatively treated group.

8. Intrapulmonary foreign bodies are removed from the lung with a lower percentage of poor results after the acute process of wounding is past, i.e., 2 to 3 weeks after wounding.

9. Early thoracotomy is indicated in wound of the mediastinum, especially the postmediastinum in wounds of the diaphragm and in tension pneumothorax not controlled by catheter drainage.

EXPERIENCE WITH LUMBAR SYMPATHETIC GANGLIONECTOMY FOR WOUNDS OF MAJOR BLOOD VESSELS OF THE LOWER EXTREMITY

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CIVILIAN experience with sympathectomy in the treatment of vascular disease made us anxious to determine whether or not this operation would be of value in the management of acute peripheral vascular trauma due to war wounds. This report is based on observations made in first priority surgical hospitals (platoons of field hospitals) over a period of 11 months. During this time we have treated approximately 500 freshly wounded urgent battle casualties with wounds of all types. Only 4 of these patients had wounds for which we felt lumbar ganglionectomy to be indicated and in these 4 the operation was performed. We have done sympathectomy on 4 additional patients seen in consultation with other surgeons of this group. These 8 cases form the basis of this report. The series is small but it will be appreciated that the number of patients for whom ganglionectomy may be considered form a very small percentage of the casualties seen in a fairly extensive and representative surgical experience.

We believe that patients presenting peripheral vascular wounds should have ganglionectomy performed for the following reasons:

1 To encourage collateral circulation as far as possible by promoting a regional vasodilatation in the extremity. Ganglionectomy does this by interruption of the sympathetic vasoconstrictor impulses.

2 To relieve spasm in the arterial tract of the extremity in the knowledge that extreme vasospasm may exist either with or without gross injury to a vessel wall.

3 In the hope that should amputation eventually become necessary it might be performed at a lower level and a healthier stump be obtained in the presence of enhanced collateral circulation.

4 In the hope that the increased circulation after ganglionectomy might help to lessen the likelihood of anaerobic infection.

Trauma to the great peripheral vessels may be of four types: (1) that in which the vessel is so severely torn that loss of continuity is inevitable; (2) that in which the vessel is so damaged that repair by suture is possible with reestablishment of continuity; (3) that in which the wound has led to thrombosis of a vessel with or without actually perforating its wall; (4) that in which the integrity of the vessel wall is not impaired but in which severe spasm of one or more vessels occurs as the result of trauma to the extremity. It will be understood that the element of spasm may be present in types 1 to 3 as well as in type 4.

We observed that paravertebral block with procaine was frequently used as an adjunct to the treatment of major peripheral vascular wounds. The rationale of this procedure is fundamentally the same as that for operative ganglionectomy, viz that by abolishing sympathetic vasoconstrictor impulses maximal vasodilatation of the lower extremity is accomplished and the collateral circulation is thereby enhanced. It is also a well established fact that procaine block of the lumbar sympathetics is an appropriate means of eliminating vasospasm. We feel that an effective procaine block repeated at the customary 8 or 12 hour intervals should suffice in management of wounds of type 4 mentioned and also in wounds of type 2 in which a satisfactory repair of the vessel has been secured and blood flow distal to the suture line demon-

strated at the time of operation. We have had no experience with wound of type 3.

It is in wounds of type 1 however in which there is injury to the vessel which necessitates permanent occlusion (ligation) that we feel ganglionectomy may prove most useful. Here we are dealing with the loss of all or a part of the major blood supply to a limb in addition at times to an associated vasospasm. The early establishment of adequate collateral circulation is imperative if the limb is to be saved. We feel that if any effort is to be made to save such an extremity all possible means should be employed and there should be no temporizing or half measures.

Ganglionectomy was elected as the procedure of choice in these cases for the following reasons:

1. The beneficial effect of paravertebral block with procaine is transitory and the injection must be frequently repeated.

2. Technical difficulty in obtaining adequate block with procaine has been encountered with failure to obtain the desired effects in some cases. The same may be said for alcohol injection.

3. We believe that ganglionectomy serves as a prophylactic measure against thrombosis. The debrided missile wound must be left open. The vessels can at best be protected only by lightly suturing the fascia over them; further closure is contrary to one of the cardinal rules of war surgery. Vessels which lie near the site of the wound but which have been spared and upon which the survival of the extremity may depend are susceptible to thrombosis. This danger is probably greater in the presence of an open wound than it would be if primary suture were possible. Should sepsis occur the threat is increased. By reason of its increased volume of flow a sympathectomized vessel is less likely to become the site of thrombus than one not so denervated. Should a surviving major vessel become occluded collateral circulation in the sympathectomized extremity will be more adequate than if operation were not done.

4. If paravertebral block is employed repeated injections may be necessary in patients who are desperately ill with associated thoracic abdominal or head injuries. Movement

of these patients to and from the operating tent is likely to precipitate shock and should be avoided if it is possible particularly in the early postoperative period. The presence of a plaster cast for concurrent fracture in some cases makes paravertebral block impossible. Furthermore the procedure of paravertebral block is technically most difficult to perform with the patient on a low cot in a crowded ward tent.

5. Even though the difficulties enumerated in paragraph 4 are not always present the surgical removal of the appropriate lumbar sympathetic ganglia is advocated because it is the only certain means of obtaining the desired effects.

Our experience has convinced us that ganglionectomy is a feasible procedure even in the severely wounded. We have had no mortality and no morbidity attributable to the performance of lumbar sympathectomy and ganglionectomy. The opinion has at times been expressed that the severely wounded battle casualty is a poor risk for extensive surgery and that in face of prolonged procedures these men do not survive. Our observation has been to the contrary both in wounds of the extremities and in other types. We feel that disaster is more likely to occur from incomplete surgery than from more prolonged but thorough procedures. The severely wounded soldier given adequate and continuous shock treatment and expert anesthesia will survive procedures of considerable magnitude and duration. We are strongly opposed to the school of thought which urges the surgeon to get the patient off the table before he dies. This fear of a death on the table may lead to hurried and inadequate operations. The surgery must be complete otherwise the patient may be lost from complications which might have been prevented.

Eight lumbar sympathectomy ganglionectomies for acute vascular injuries of the lower extremities are reported; the total number that we have performed up to the time of this writing. In 6 cases amputation subsequently became necessary. The other 2 patients achieved sound normal limbs. On the basis of these results one can neither praise nor condemn the procedure as used for this type of

injury. We intend to continue its use in the effort to determine definitely its place in the management of acute vascular wounds. A larger series of cases and knowledge of the experience of others may yet prove its usefulness.

CASE REPORTS

CASE 1. Civil n g e d years. W nded by h nd grenad at 3 30 p m D mber 9 1943. He brought t the fi ld hosp tal 2 hou s ft rin ry. A bulky p es red es i g had be n applied to th ght gr in p rt all contr li g hemorrh ge. E am i at on sh wed s pe fic al ounds of the abd minal w ll and ight lwer l g and a 3 cent m te p ne t t g wound f th ght gon f om which there w acti e bled ng. Th p t t as in m led e ethasmic sh ck pal and with un bt inable pul nd blood p ur Du gadmm t at n of bl od nd pla ma th hock tent hem rhage fr m th gon becam so p of s that th p t nt a an thetized by pen dr p eth and th vess l w e cl mp d. The calf w n t tense. At n tim w s y p hat n f lt in the a ter of the foot.

Aft ntul shock tr tm nt the anestht d p t tw tak nt oth p t ng t nt Op t n mm c d at 7 3 p m. The fmo l rt v s f nd to b c mpltly ev ed b ut nch b low the gn of the p ofunda. Th latter a te y wa int ct nd p ls ting. The f m l t ry was l gat d w th lk. Th f m l v in was compltely v d at th l el f the ugn f the p f nda b ch a d ts ends e l gat d with silk. Th fo gn body wh ch lay in th eg on ft e p jo nt w s not found. The th w unds w e d b d d. Rght lumba p avert b l block wa d ne d t buting cub c tmet r s f p ent p oca e in the gn f the d 3d nd 4th lumb r g gl. Th f tw warm pink a d dry at the end of the p t. A bulky c tt nd es g was appli d t the nt l g.

Th f llo wing m ng the l g nd f t st ll ap pea ed vabl. At 3 m ght l mba sympa thect my was d e thr ough th pp ach ad cat d by Sm thw k and th d and 3d g ngl a th th terv g hai w e emo d f ll g p t nd u t l cuati n day l t th ght f t was d y d w m th n th l ft.

This was our first case. The child was practically exsanguinated when first seen. After the beneficial result of the paravertebral block was observed it was felt that sympathectomy should be done to give maximum possible re-establishment of circulation. The possibility of thrombosis of the femoral artery lying in an open wound susceptible to infection was considered a further indication. It should be noted that the calf was not tense.

CASE 2. American s lde aged 5 ye ust ed gunsh t w nd t 11 00 a m Decemb r 943. He a n ed at the fi ld hospital about 1 h r after injury. One m t n h found to l n sever sh ck. He had a p forat ng ound f th ght buttock and a sm ll p n t ting w und n the r g n of Scarpa triangl n the rght. The popl t al and dors lis p dis p be on the right were un btainable. The calf was not t nse. X ay examinat on ho ed a f ctu e of the coccyx nd a bullet near th head of the rht femur. On d g tal examinat n a t a of the ectum, as found.

At 11 45 p m ope tion as commenced. A loop sigmo dostomy was don and xtens ve deb idement f th butto k wound was pe formed ith closure of the r ct l tear and r section of the coccy. Th femoral t ry and v in w e expo ed at th pro f nd rea. A hematoma in th vall of the artery was evac ated by longitud al inci n h ch w then d ed. The ad entit wa trpped f om the all f the a tery f r a d tan e of 6 inches as to pe f m peia teal sympathectomy. P latons w observed below the tipped a ca h ch v s dist l t th p of nda b nch. The leg was p t n e tens on a K ller Blake spl nt.

On D mb r t was noted th t the foot s cold nd blanched and the d rsal pedis p ls was n t palp bl. A g ngl on ctomy wa adv sed and p formed at 8 p m. The Sm thw k app ro ch us d and fo nd part e la ly c nv nient b cause f th pr s nc of the lost my. The d and 3d g ngl v th interv ng n e re em v d. Fol low ng op at n the was no d c ibl change the ppea nc of th foot.

On D cember 23 the l g v a m to th ankl but the foot r ma d cold. Th pati nt wa evac at d a fe d dys l at w th t mp ov m t n th circut n of the foot. On J a y s 944 a g e al hospital a g l tn lower leg am p tation wa d ne l v ag at hual t mp of abo t 7 inch.

In the light of subsequent observations we feel that sympathectomy was performed too late in this case to be of maximum benefit. The procedure may have saved the knee. It is possible that this man suffered embolism from the traumatized femoral artery.

CASE 3. Am can sold g d 2 years was ound d n a t on by h ll fragment at 4 00 p m. D c mb 23 943. H a r ved n the fi eld h p tal b t 3 h urs fter und g. Wh n first ch h w s n m k d d gre f sh ck. Bi od p es u e and p l w mp c pt bl. The e wa small p n trat g wou l m the upper p rt on f the ight thigh nt lv. A to rn q t was in place and wa ad q ate t ntr l hem h ge wh h had ppa entlv b en m t s. Sh ck th apy v th blood a d plasma w s mm dately nst tuted. M e det l d m n t n of the rght leg r vealed that the calf was f m t ns nd tend even tho gh th e w s no wo nd b low th g ou n and hus n j ry w s only

We believe that sympathectomy perhaps saved this extremity. It is to be noted that the calf was not tense. The case was favorable in that operation was performed 8 hours following injury.

CASE 6 Am can old r aged 23 yrs was undened in a t n by artll y fragment at 3 a m March 6 944 H w adm tted to the field h pit lapp mat ly 4 hours after injury. E am tion d s losed th t he had multipl penetrating nd f the r ght thigh and leg l f t m and leg d left be t wall Th r ght calf was t nse and the fo t w p lseless Hov the f t was not bl nch d nd though ol th n th left was not ton ld There was n f ctue Th p t n t w s n t n s e sh ck

At 9 50 a m Ma h 6 perat n was ndert ken ll w nds e e d b u d d and ll f g n b d u e re mo d Th ight fem l a t e y was f und to b d f bout thr fourth of t s c mfer n e n s to lo th d and ut e was not f asibl e c us f th ext nt f the t um Th r t ry was d d d and l gated with silk The f m al in was intact nd as n t l d Th fo t was c ld and bl nched at th nd f th s p cedur A ght lum b g l t m y s th n p e f m d th o gh a l t l t p t e l g d nci n Th d a d 3 d g l a d t r v n n g n v ew e r eted Th l g wa pla ed a l i d h avily p dded cast Th ght l g nd f t w arm for ab t h ft y m p th c to m y b t w e n e v e warm as th l f t d th f t g r d l l y d p p a e d On Ma ch 19 th f t was l d nd m t t l n g w begun n g to appe On Ma ch th was s v e p a n n th leg nd foot wh ch w c ld nd m t t l d f m th a l l d w n C l f m cl wer sw llen and th a p t t dem f th sk i The nd w l Th c w s den e f gas g n g n At 4 00 p m p c d l a g u l l t n e amp t t o n f the ght l g a ca d ut S b g t t amp tat the pat t d d w ll nd was t d m p d

This case should be compared with the preceding. Both were seen relatively early. The injuries were similar and at approximately the same level. Neither patient had lost an extreme amount of blood. The outstanding difference was in the preence of a tight calf in Case 6. We now feel that the addition of a fasciotomy might well have saved the leg.

CASE 7 S ld g d rs J d b y h l l f g m t t 4 00 a m Jan y 4 944 O a al t th f l d h osp tal m h r s i t h as f n l t b f f g f m p e f t g u l f th l th d f th r ght thigh th m p nd comm ut d f t f th f m H w in m l d h ck nd v a not ble d g H g ne al

cond t n was descr b d as f r No not was mad c cernin pulses f foot r c nd t n of call

At 6 0 p m the same d y op at on was p f med Wo nd of entry and e i v r débrid d The v cl wer app entlv n t v i a l z d A T bruk typ splint was applied and immed at ly spl t w d ly because f l ck of c c lation in the foot Th po tope ative d agn i was c mpound com minuted f a ctu re f the r ght femur i its l we th rd with possible damage to th vess ls of th thigh and chem a f the fo t

On J nuary 5 t 8 00 p m v we e asked to see th p t n t n consult t n H as c mplain ng of sever p n in the lower l g Th l g vas n a widely pl t Tobruk spl n t N pul ere p l pabl in th f t The leg f m m d calf to t es v a mottled cy not c nd ld At 10 30 p m s me 42 hou s ft jury nd 28 hours fter th f i t pe at n a r ght lum b r ga glon c to m y w s d ne thro gh gridir incus n in the low q ad nt In th m erval bet een the first p at n and y m p thec to m y he had had the lumba para ert b l n voca m j t o n s with n p p ent benefit Th sym path c t m y w app entlv n v a l and n J nua y 3 m d th g amp tat n v a don just b v th fra t u ste It as n t d that the fem oral t r y and w th r m b s d at th s t e o amput ation but th t c l l a t l c c l a t n w a w ll de l p e d Co rse fter amp t t i o was ev nt f l a d n l b u a r y 4 th t n t cuat d

We believe that sympathectomy this late following injury is of no avail. When patient was first seen the damage was irreparable and loss of the leg inevitable. Under these circumstances in the future we should not perform sympathectomy.

CASE 8 S ld g d 9 y ars s o d d by t l l r y f a g m t t 5 00 m M v 6 944 On l n th f l d h p t l h f und t h v mult pl pen tat g o d s f th ight a n a d l g m p und c m m n u t d f c t f th ight hu m ru nd c m p nd c m m n ted f a t e s f th r h t b a nd h b l a Ther m p r e d i c l a t i n n th r ght fo t the m m b as c l d d cyan t distal to l h t 4 ches abov th l l d ther e n o p l s palpable

At 3 00 a m M v 7 l l nd wer d b r d d A pla t b d v s t w s p p l d f th f ctu f th ght hum us A c u l plast w a ppl d t th ght l g f o m t e s to m d thigh It was n t d that after p p l at n f th pl ster th c culat n n f t m p d L m b m p th t c b l k was c n s t d b t n t d n w h c l a t i n m p e d

At 00 p m M y 7 th to f the ight fo t e f nd t b blu h Th d tal p r t o n of th l g as m t t l c yanot c and c l d n p l s p e s n th fo t Th c l f s t n s Th p t e t h a d h t w l m b p a a e t b l j t n s f p o ne nce h first op at on It was d c d e d to do

symp th etomy and this w pe f med at oo
p m by tilzing the lo er q ad nt grdur n in
c sio No benent as n ted f om ths pr cedur
At 5 00 p m May 7 gas g gen was f nd to b
p ese t i the leg a d a m d thigh mputat n w s
done unde ether

Follo ing amp tat ec very was g d

The remarks made in comment on Case 7
apply equally here

CASE 9 Briti h officer ag d 6 v ars w nd
d by a spent mach n g n b l l t 9 00 m on
N embe 9 943 cee i penet at g ound of
the left thigh At the t me he was wound d h had
b n lv ng n a muddy slit t nch f r 48 h rs d
h d bee ith t food d i th t m Sh rtly
after receiving the bullet wound he ht in
th s t m by a hand g nade wh ch burst cl to his
trench d ca sed a p trat ng wound of the ri ht
ye He lay where he as hit f r about 4 hours
He reach d the casualty cle ing tat n som 34
hours fte bei g first ounded At that t m h was
m ldlv acidotic in slight shock (bl d p ess
100/7) and not ble ding A m ll pen trat g
ound as present in the md porti n f th l ft
th gh poste i ly The m sil was p lp bl s b
cut n ou ly te o ly Pulses w r p es nt n foot

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b r io Th foreig b dy in th l g as m d
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e try as enl g d and d ebr d Th fem l n
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l gated ith silk The t ry as vis bly d p l
p ably in marked spasm H w ver f ble p lat ons
s t come th ough and th spasm t l
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th e as difficulty ntrol ng bl d f om th
en and a od ng i jury t the i tact a ter v a d
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q t ty of bl od a d eq d th adm t t n f
bl d and plasma d ng th op at n Wh n th
p c dure as compl et a p ve t b l p can
i j ct on of o c b e c e t m e t r s in th g n f d
a d 3 d l m b rg ag l a s d iths m wa m ng
f the calf res l g b t n p l es we p l p bl n
thef t H i g n r l nd t n pp d f r l g d
p l s wa 3 b t f g d q l t v d bl d p es
n m l t t h e m f t n t th w d

At m dn ght of th d y of pr at h rad l
p l e a g d Th f t h e as cold
c t c a d p l s Th pat t was t y t
c ed from the anesth t c Ea ly th f ll w ng
m rn g h b cam d nt d p s became rap d
l bl d p es re f ll Th e was n d f
gas nf ctio In pt f v g ppo t
meas es hef l d t c d d d t o o a m
N embe i

A topsv as nf tu t ly t po bl H m y
ha d d of blast inj y d t th rv l
plo n f the h d g n d H h d t r m i l
a r a nd death m y h b d t transfus n

ction It is c t in that he was in a m e p
ca ious phys iolog cal state at the t me of ope rat
than was fully app eciated a d tho gh h was co
pe ted when the ope rat n was sta ted t took th
los of only a elatively small amo nt of blood t
p ec p tat sh ck dur n the proced e

The effect of paravertebral block in this
patient was definite though not complete
satisfactory in that restoration of circulation
to the foot was not effected It is possible that
had he not suffered from severe peripheral
vascular collapse repeated lumbar block
might have permanently relieved the arterial
spasm Repetition of the block or sympathectomy
was contemplated the choice between
the procedures to depend on the condition of
the foot 8 hours after operation However
the patient's collapse demanded that all
efforts be directed at saving his life This was
were unfortunately not able to do

EVALUATION

In reviewing these histories it becomes ap
parent that in Cases 7 and 8 too much time
was lost between injury and sympathectomy
for the latter to be of benefit As the sum
maries of these 3 cases show the lower leg in
each appeared nonviable at the time of gan
glianectomy If sympathectomy is to be done
it should be done as early as possible that
at the time of the original operation for the
injuries From our experience with these 3
cases it would seem hardly worth while to
employ sympathectomy in patients in whom
the limb is already clinically nonviable

A condition commonly seen in lower ex
tremities with acutely impaired circulation is
the so called tight calf This condition was
observed in 2 cases (3 and 6) In neither were
the wounds so situated as to cause hematoma
of the calf It is thought that tight calf is due
to a cloudy swelling of the muscles due to
anoxia The condition can arise early (Case
3) We feel that in such cases one may pos
tulate that sympathectomy without extensive
lower leg fasciotomy is useless Unfortunately
we failed to employ fasciotomy in these 2
patients Whether or not the legs would have
survived had we used a combination of sym
pathectomy and fasciotomy we do not know
but we strongly urge a combination of the

two procedures and intend to employ the combination in such cases in the future. Tense calf muscles are seen sufficiently often so that one should always examine the lower leg in these patients to determine the presence or absence of tension.

In wound of the lower leg hematoma frequently comprises circulation distal to the point of trauma. Extensive fasciotomy with out sympathectomy has been employed by us in such cases and found sufficient to save the leg even when two of the three major vascular bundles were severed. When the condition of the patient with such an injury has permitted the use of spinal anesthesia we have felt that the temporary interruption of vasoconstrictor impulses has been beneficial. This property of spinal anesthesia should be kept in mind and its employment in carefully selected cases may prove advantageous.

We believe that certain indications for the performance of ganglionectomy may be proposed. The possible benefit to be derived from the procedure should be considered in the management of any traumatized extremity presenting evidence of vascular impairment. Points to be searched for in examination of the patient are the absence of pulses in the foot and popliteal space, a leg colder than the normal one, blanching, cyanosis or mottling of the foot or leg, early loss of cutaneous tactile sensibility and the presence of a tight calf. The presence of any of the foregoing conditions should serve as a warning that serious vascular damage exists and usually several of them will be found in the same extremity. The presence of tight calf we believe to be of particular significance in indicating as it does a serious degree of anoxia.

Given any of the physical findings mentioned it is imperative that at operation upon the wounds the surgeon visualize and completely understand the exact nature and extent of the vascular injury. In the majority of patients presenting the signs we have mentioned either direct injury or severe spasm (or both) of a major vessel is almost certainly present. If damage to a major vessel is found in a patient presenting these signs we believe that sympathectomy should be done. If spasm alone is found paravertebral block

should first be tried and may well prove adequate. Should the patient's other wounds make it apparent that repeated blocks will be arduous for him sympathectomy should be done at the first sitting.

We believe that the patient's chances will be favored if ganglionectomy is done in all wounds to the iliac, femoral or popliteal arteries and in patients with wounds of the thigh who present a tight calf. Sympathectomy should be considered as a prophylactic measure in dealing with wounds to major vessels (e.g. the superficial femoral artery) if the circulation is not grossly impaired.

There are certain contraindications to ganglionectomy. It will obviously serve no useful purpose in limbs so severely traumatized that primary amputation is necessary. If the patient is seen late following wounding the likelihood is that sympathectomy will do no good. In general if a limb appears nonviable and changes are at all advanced with a beginning line of skin demarcation sympathectomy will probably be useless. Our earlier hope that the operation even in these cases might save a part of the limb and make possible a lower amputation has perhaps been borne out in 1 instance (Case 2). In patients in whom the time element is borderline it might be well to perform paravertebral block and base the final decision for or against ganglionectomy on the observed effect (Case 9).

It will be appreciated that great attention to detail is necessary in the handling of the type of injury under discussion. The dressing is particularly important. We have found that a satisfactory method of protecting an extremity with precarious circulation is to wrap the member in an extra thick layer of cotton from toes to groin and to incorporate it in a light circular plaster cast with a firm posterior splint. Then the entire cast and padding must be bivalved. Examination of the leg can be made simply by removing the top shell. The object of such a dressing is to give an even distribution of pressure and thereby prevent pressure points and necrosis.

A word should be said with regard to the use of dorsal sympathectomy for injury to the vessels of the arm. We have seen no case either of our own or of our associates in which

this procedure appeared indicated. As one would expect the collateral circulation in the arm is practically always adequate to assure viability (e.g. Case 4). Patients we have seen with vascular trauma sufficient to jeopardize the limb have all required amputation because of the extent of the damage to other parts. A rare case may be seen in which this condition is not so, and for this dorsal ganglionectomy should be kept in mind.

Two points must be finally emphasized. First, ganglionectomy to be of benefit must be performed early; it is probable that after 24 hours tissue damage is irreversible. Second, ganglionectomy is an adjunct only in the management of these wounds. Thorough debridement with meticulous care for the structure involved, complete visualization of the pathology and attention to detail in dressing are imperative. Supplementary procedures must be performed as indicated: fasciotomy for tight calf may be cited.

TECHNIQUE

The rationale of the operation of ganglionectomy lies in the fact that when the central vasoconstrictor impulses to a vessel are interrupted, maximal relaxation of the arterial smooth muscle results. It has been further demonstrated that the most permanent and complete results are obtained by a procedure which interrupts preganglionic fibers only. This is accomplished satisfactorily in the case of the lower extremity by removal of the second and third lumbar sympathetic ganglia (1).

We have employed an extraperitoneal approach to the lumbar gangliated chain in all cases. Three were done through the flank approach advocated by Smithwick; the others through the large lower quadrant gridiron incision of Leriche. We have found that the approach of Smithwick is most convenient in small patients and in those in whom the presence of other wounds made the gridiron incision impractical (Case 3). It has been found, however, that if one does not have available certain instruments, particularly Deaver retractors longer than those in standard use by the Army, Crile nerve hooks, Hart

man forceps, Cameron light and a long dura clip carrier, that the operation is technically difficult due to the depth of the wound. It is also impossible to place the patient in optimum position for this approach on the operating tables available in the field. Therefore, we advocate the lower quadrant gridiron incision for the usual case done in forward hospital.

The transperitoneal approach which we have not used might prove the most feasible in patients requiring laparotomy and sympathectomy. We have had one such patient in whom the missile after penetrating the groin perforated the right external iliac artery and passed upward causing extensive visceral damage. Transperitoneal sympathectomy through the laparotomy incision would have been performed on this patient had he survived his massive hemorrhage and intra-peritoneal damage.

SUMMARY

It is our opinion that lumbar ganglionectomy if it can be performed early, should be considered in the management of wound from the bifurcation of the aorta to the bifurcation of the popliteal artery which jeopardize the circulation to the lower extremity. The real test may lie in its use in cases of severed popliteal artery for very few extremities survive with injury to this vessel. Presence of an intact profunda femoris artery in the face of loss of the superficial femoral has been found to be no guarantee of the viability of the extremity. Collateral circulation of the lower leg has been found to be sufficient even in the presence of ligation of two of the three major vessels. It is felt that ganglionectomy will be less frequently indicated in injuries to vessels of the lower leg than in those of the thigh.

It is our hope that this paper will stimulate the interest of others in the use of ganglionectomy as an adjunct to treatment of wound of the major peripheral blood vessels and that their results will be reported. Thereby the true value and place of the procedure in treatment of this class of wounds may be established.

REFERENCE

SMITHWICK, R. H. N. E. gl. a. d. J. M. 94 699-5

ASEPTIC GASTRIC RESECTION

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NEARLY forty years elapsed between Souligoux's proposed technique of gastroenterostomy and the present method of gastric resection with closed aseptic anastomosis. The latter has been advocated by Wangenstein, Babcock, Totten, Holman, Weinstein, Emerson, Neuber, and Monteiro.

It is interesting to review the technique which avoids opening the stomach and intestinal cavities at the time of anastomosis. Briefly stated, it is as follows:

1. With a special forceps the portions of the stomach and intestine where the anastomotic opening is to be made are crushed. This crushing traumatizes particularly the mucosa and muscularis and has the least effect on the serosa.

2. Caustic potash is applied to that portion of the gastric and intestinal serosa demarcated by the blades of the forceps.

3. A seromuscular suture is made around the crushed and causticized area. After 48 hours when this tissue sphacelates the anastomotic opening is sealed off without contamination by coalescence of the serosas held in apposition by the sutures.

Gudin, Wadhams, Luquet, and others have contributed much to the development of aseptic gastrointestinal anastomosis. Wadhams and Luquet advocated electrocoagulation of the walls of the stomach and intestine followed by seromuscular sutures around the electrocoagulated area such that when the eschar separated there was already coalescence of the serosas and the opening was established without contamination. This is essentially the principle advocated by Souligoux.

Closed intestinal anastomosis has been popular since Doyen in 1897 in an effort to effect hemostasis. He established the principle of crushing the intestine in order to close it aseptically. With his angiotribe the intestine was reduced to paper thinness. With his

procedure contamination from intestinal contents was avoided and its use was advocated in end to end anastomosis, ligating the crushed ends, bringing them to apposition with seromuscular sutures, cutting the ligature with scissors introduced through the opening just before completing the encircling sutures.

The method of Doyen was followed by various means of closed anastomosis differing only in minor details. Some surgeons have given preference to anastomotic clamps, others to traction sutures.

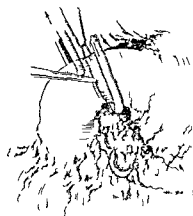
It is not in the scope of this paper to discuss all the various methods of closed intestinal anastomosis. The closed method of intestinal anastomosis was worked out at our clinic while the open anastomosis for the stomach was still in use. Hemorrhage was feared if the mucosa was not sutured. The few immediate and late bad results were accepted because of the 80 per cent good results.

In 1918 Gudín, in discussing asepsis and hemostasis of gastrointestinal surgery, reported his first failure in aseptic gastrectomy. In 1939 and again in 1941 Gudín presented in Rio de Janeiro and in Buenos Aires motion pictures illustrating his technique of gastrectomy with closed anastomosis. Before the National Academy of Medicine in 1943 he presented a paper in which he brought forward the value of what he termed lamination. He presented his own instrument which he believed insured hemostasis and at the same time he emphasized the importance of using traction sutures as recommended by Pauchet instead of anastomotic clamps. He believed that his method was a further improvement in gastrointestinal surgery.

Since 1935 the von Ietz (5) suture instrument has been used in our clinic to close the duodenum in gastroenterostomies and also to close the large bowel after surgery. In typical subtotal gastrectomies the technique of Reichel-Polya as developed by Montenegro has been continued. When the von Petz suture



F 3 T t pl d th ru h d p t f th
d od W se g th h th nb th
Bar t gull t



F 4 Th t mp f th d od m b d th
h w th rush d t f th t sc h w th gull t
has t th ty t d losed sept vity

instrument is used the technique of Hoffmeister Finsterer¹ followed the clip from the segment of the stomach to be anastomosed are removed and the operation is finished by the open method.

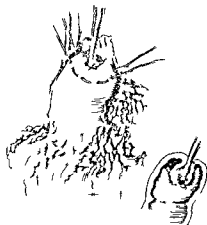
In the beginning of 1943 the technique to be described was devised. It was decided to apply the closed method of anastomosis in gastric resections for the following reasons: (1) the reliability of the closure of the von Petz suture instrument, (2) the assurance of hemostasis by electrocoagulation, (3) the good results of closed aseptic anastomosis in bowel

surgery, (4) the good results obtained in our experiments in dogs, and (5) the opinion of other experienced surgeons voiced in recent publications—Wan, Ensteen, Babcock, Totten, and Holman.

In 1943, 2 gastric resections were performed by the new technique in Buenos Aires. After witnessing the operations Prof. Gahrdez remarked that the technique was revolutionary. It is our opinion that it is evolutionary rather than revolutionary because it merely advances one more step the technique of closed anastomosis of the gastrointestinal tract. It



F 3 T t pl d th ru h d p t f th
d od W se g th h th nb th
Bar t gull t



F 4 Th t mp f th d od m b d th
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has t th ty t d losed sept vity

is my belief that the present technique of anastomosis insures asepsis simply because the sutures do not pass through all coats. Sutures that do pass through all coats act as drains from the cavity of the gastrointestinal tract into the subserosal space.

The absence of edema about the anastomosis eases the postoperative course to such an extent that there is no need for the employment of the Abbot Rawson tube. It is impressive when the postoperative course following this technique is compared with that following open anastomosis.

While the perfect method of aseptic gastrectomy has not been developed we do appear to have arrived at a safe technique that brings excellent results. On the basis of the results in 40 cases in which patients were carefully followed it is believed that this new technique can be recommended. It is possible that further improvement in technique will include the use of a special insulated clamp that will permit the employment of an electric cautery after the completion of the seromuscular suture.

Another problem we hope to solve is how to deal with treacherous duodenal ulcers while



Fig 5 The pylorus is closed with a rubber cap. The stomach is sutured to the duodenum with a suture that passes through the stomach wall and the duodenum. The suture is secured with a clip.

adhering to principle of closed aseptic surgery. Up to the present time submucous separation has been done according to the method of Montenegro which seems preferable to the technique of Nissen. This very interesting subject will be discussed in another article which is soon to be published and in which will be considered the question of whether or



Fig 6

Fig 6 The stomach is closed with a special lamp. The stomach is sutured to the duodenum with a suture that passes through the stomach wall and the duodenum. The suture is secured with a clip.



Fig 7

Fig 7 The stomach is closed with a closure. The stomach is sutured to the duodenum with a suture that passes through the stomach wall and the duodenum. The suture is secured with a clip.



Fig 8

Fig 8 The stomach is closed with a closure. The stomach is sutured to the duodenum with a suture that passes through the stomach wall and the duodenum. The suture is secured with a clip.



F 9 l ft Th p th d f th t m ch ha b lo d th l ps h
 b m d f m th l tw th d Th j j m b h d th ru h
 l mp f G d b g d
 F g Th M t lamp pplied t th gi f rush d ea f th
 j j m d th es f ru h d tss b ung m d w th th l t c knif
 Th l w fi h l t gul t f th cut m a f j j um th m
 p oc d w f th t m ch ft th lp m d

not terebrant ulcers of the duodenum should be removed and also how to proceed with this step without interfering with the aseptic technique

TECHNIQUE IN GASTROENTEROSTOMY

1 The blood vessels of the greater curvature are ligated either above or below the great arterial circle in case an ulcer is present and always below in case a malignant growth is present

2 The pyloric and gastric arteries are tran fixed and doubly heated

3 The duodenal stump is closed in the following manner

a The stump is crushed with De Martel's clamp and tied with a temporary suture that is cut with Barreto's guillotine after the stump has been inverted by means of a pursestring suture

b A von Petz (5) clamp is applied followed by inversion of the stump with a pursestring suture or with the Halsted's quilt suture

TECHNIQUE IN GASTROJEJUNAL ANASTOMOSIS

After the von Petz suture instrument is applied to the stomach at the level to be removed the clips are compressed and a special clamp of my own design is applied just above the proximal row of clips. By means of an electric scalpel the stomach is severed between the two rows of clips thus removing the distal segment. Two types of clamps of my own design are used (the larger one for the Reichel Polya anastomosis the smaller for the Hoffmeister Finsterer type the latter being preferable). The clips remain on the portion of the stomach which is not to be used in the anastomosis and are burned with Halsted's quilt suture.

A jejunal loop about 20 inches in length is selected for antecolic anastomosis. The portion to be anastomosed is crushed with the T laminator clamp of Gudin then removed and one of my own clamps is applied. The jejunum is approximated to the stomach and under the clamp the posterior seromuscular suture is made. This suture begins at the

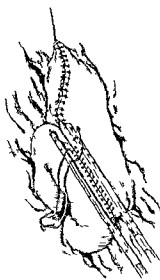


Fig 1

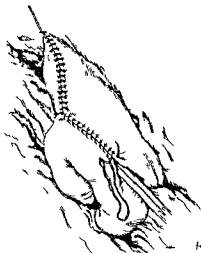


Fig 2



Fig 3

Fig 1 Se m scular s tur bet th t m ch nd
jun m falls below th lamps
Fig 2 Th muscula tur carried th
clamp to th t n wld w t th bas f th lamp

Th lamp rem ed then and th t mpt t d
Fig 3 Aft th muscula tur mpt t d ll
und few enf ed t rupted t es pph d n
the t n d post n wld t th gles

base of the clamp and extends up to the tip of the clamp. The excess of crushed jejunum is removed and also the distal row of von Petz's (5) clamp from the stomach.

The cut edges of the stomach and jejunum are lightly electrocoagulated. This done the seromuscular suture is continued around the tips of the clamps and above them until their base is reached. At this point the clamp is removed and the suture is completed by closing the fenestration which has been caused by its removal.

The efferent loop of the jejunum is then buttressed over the suture line of that portion of the stomach not used in the anastomosis. A few reinforcing interrupted sutures are applied at the angles and around the circumference of the anastomosis to complete the operation. The anastomosis is made patulous immediately by the employment of the thumb and forefinger from the outside.

COMMENTS

The method of aseptic gastric resection here described has been found most satisfactory. With it it is possible to avoid filiform

drainage along the sutures from the mucosa. This drainage with contamination is inevitable if the sutures run through all layers of the stomach or bowel.

The von Petz (5) and similar clamps have been found most useful in carrying out the procedure but they can be dispensed with when the electric scalpel and the so called laminator the crushing clamp are used. Slow and gradual crushing alone even if prolonged for one hour does not guarantee hemostasis.

That certain trephating ulcers are not satisfactorily handled by crushing should not prevent the use of closed anastomosis where indicated any more than should the occurrence of perforated ulcers. Nor is one justified in my opinion in advocating open resection for gastric ulcers and closed anastomosis for carcinoma.

SUMMARY

An improvement in the technique of aseptic gastrectomy is described. The technique has been used in 40 cases of ulcer with 1 death. This death was not the result of faulty technique.

The technique described might have been adopted earlier had I not felt satisfied with 80 per cent good results and fear of hemorrhage. Only after becoming confident of hemostasis by crushing and electrocoagulation or ligation of the submucosal vessels through experiments on dogs was the decision made to abandon the mucosal suture and to adopt this new technique.

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 WAD AM R P d CAR V S g Gyn Obst
 935 6 S
 WA O S g Cyn Obst 94 7 59
 3 W R M L d ADAM L Am J S re 94
 58 3

SUCKING WOUNDS OF THE CHEST

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and JOHN E TUHY MD Captn MC AUS Portland Oregon

SUCKING wounds of the chest are met commonly among the seriously wounded casualties admitted to an evacuation hospital. While they are encountered seldom in civil practice and infrequently in military hospitals not in the field we believe that our experiences in dealing with them may be of interest to surgeons engaged in war surgery in forward hospital units and to others doing secondary thoracic operations for the late complications. This communication will deal with the preoperative operative and postoperative management of patients with open wounds of the thorax up until the time that those who recover are well enough to be evacuated to the rear. This echelon of surgical treatment is today a field in itself. Only the immediate results can be presented since the end results in this group of cases cannot be known for some time.

During a 3 month period 70 patients with sucking wounds of the chest were treated in an evacuation hospital during a very busy period. These patients represented 8.1 per cent of a total of 89 casualties with injuries of the thorax. Of this group 31.5 or 36.7 per cent were known to have hemothorax pneumothorax or both. This figure undoubtedly would have been larger if condition had permitted more complete study. The progressively increasing dangers associated with open pneumothorax however made the sucking wound group the greatest problem. Shock mediastinal flutter with interference with cardiac action anoxia from ineffectual respiration loss of body fluid and heat and infection of the pleural cavity are some of the particular hazards encountered.

DIAGNOSIS

The diagnosis of an open chest wound had usually been made at a forward installation

and an occlusive vaseline gauze dressing with tight adhesive strapping applied. In some cases however the diagnosis had been missed and a sucking wound would be found under the original blood soaked battle dressing. In only 1 of our cases had emergency suture been performed and incidentally this proved to be ineffective. A properly applied vaseline gauze dressing was nearly always adequate. On admission of patients with chest wounds an inspection of the dressing was made at once on the shock ward or in the preoperative wards and the patient was asked to cough unless the diagnosis of open pleural communication was obvious. A gush of air or blood on coughing occurred in positive cases not previously detected. A good occlusive dressing was then applied.

Of equal importance and perhaps of more importance than the diagnosis of the open pneumothorax is the question of the diagnosis of factors complicating the picture in these patients namely the presence or absence of shock severe respiratory or circulatory embarrassment hemorrhage from the lung or chest wall injury to the mediastinal or abdominal organs and injury to the contralateral lung. Moreover the surgeon is interested in the number and location of fractured ribs and foreign bodies and the extent of any associated injuries which in themselves influence the various decisions he must make.

CLINICAL FINDINGS

In our group of 70 cases 48 wounds were the result of shell fragments 18 were incurred by machine gun or rifle bullets and in 4 the type of missile was not stated. In 49 instances the wounds were of the penetrating type in 20 they were perforating i.e. through and through and there was 1 gutter type of wound. Fractures of the ribs or costal cartilages were known to be present in 44 cases 20 of which had multiple fractures but the true figure was probably higher. In addition

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fracture of the clavicle was seen in 3 cases and fracture of the scapula in 1. Right sided wounds were nearly twice as common as left sided 45 of the former as compared with 23 of the latter. Presumably left sided wounds were more frequently fatal on the battlefield. In 2 patients there were bilateral sucking wounds and in 4 there were 2 sucking wounds on the same side. Shock was present on admission in moderate or severe degree in 37 cases. This figure would probably have been higher had not many cases received from 1 to 4 units of plasma and in a few cases blood transfusions as well as forward installations. Severe shock was of course more common in the sucking thoracoabdominal wounds and in large thoracic wounds with considerable bleeding. Slight to moderate dyspnea was present in two thirds of these patients most of whom required oxygen and there was severe dyspnea and cyanosis in 9. Wound hemorrhage was severe in 9 cases and was important not only because of the blood loss involved but also because it was liable to loosen the occlusive dressing and re-establish the open pneumothorax. All cases had some degree of hemothorax and pneumothorax but the former was severe (estimated at 1000 cubic centimeters or over) in 10 cases. Only 1 instance of tension pneumothorax was found in 1 patient with a valvular sucking wound at the medial end of the left clavicle. Mediastinal emphysema caused by a small laceration of the trachea was also present in this case. Another instance of moderate mediastinal emphysema occurred in a patient with perforation of the trachea which required closure and tracheotomy. On admission to the hospital pulmonary edema was well marked in 3 patients 2 of whom died though the condition probably occurred more frequently to a lesser degree when one considers the lung damage and paradoxical respiration commonly present in open chest wound. Right sided heart failure may be precipitated in such cases by the large amounts of blood and plasma used in combating shock especially if they are given rapidly. The treatment of shock complicated by pulmonary edema is very difficult for this reason. The significance of blast injury in these cases is difficult to assess but is probably

not often an important consideration. The diagnosis was made in 1 of our cases from the history and by roentgenograms. Atelectasis was diagnosed from the admission roentgenograms in 8 instances. There was homolateral partial or complete collapse of a lower lobe in 7 cases and a contralateral atelectasis of the cardiophrenic segment in the other case. In addition densities attributed to intrapulmonary bleeding and to aspiration of blood into the bronchial tree of uninvolved portions of the lung were met with frequently. Moderate to severe gastric distention on admission was evident in 5 cases. This complication is to be watched for especially in wound of the lower left thorax. Morphine poisoning was encountered twice and in 1 case characterized by respiratory depression pin point pupils cyanosis and terminal convulsions it contributed largely to the fatal outcome. One half grain of morphine tartrate had been given hypodermically before admission in practically every case and the familiar phenomenon of increasing morphine effect as the patient's shock improved was sometimes troublesome. The use of not over 4 grain of morphine sulfate is recommended as the first dose in the average chest wound and no more than 1/6 grain dose subsequently. Bilateral and multiple sucking wounds have of course a grave prognosis. Two patients not only had 2 sucking wounds on 1 side but also 1 sucking wound on the other hemithorax both died. Two other men with 2 sucking wounds on the same side recovered. Associated injuries obviously have great significance especially abdominal injuries (21 cases) severe compound fractures (16 cases) and spinal cord injuries (2 cases). Apart from abdominal injuries there were severe associated injuries in 22 patients and slight or moderately severe wounds were present in many others.

EMERGENCY AND PREOPERATIVE CARE

All patients known to have sucking wound were treated in the shock ward and oxygen therapy started if necessary for dyspnea and cyanosis. Patients were left on the same litter until they arrived in surgery and some times until they reached the postoperative

ward. The blood pressure and pulse rate were determined immediately and at frequent intervals as a guide to treatment and prognosis. Patients in shock without much dyspnea were left flat until they improved, then they were propped up in bed. Those with dyspnea were more comfortable reclining on a back rest from the outset.

A transfusion of stored citrated blood was begun as soon as possible in those showing signs of shock and hemorrhage. Even if the blood pressure was within normal limits these patients were known to have lost blood, and it was nearly the rule to give at least 2 units of plasma and 500 cubic centimeters of blood to each patient. Early in the campaign the blood was altered into an equal quantity of normal saline or plasma for greater ease of administration. Later more transfusions of whole blood were given especially in cases in which it was anticipated that 1000 cubic centimeters or more of blood would be necessary to lessen the likelihood of pulmonary edema from the administration of too large amounts of intravenous fluids. In 27 cases in our series one 500 cubic centimeters transfusion was given before or during surgery; in 16, 1000 cubic centimeters was given; in 4, 1500 to 2000 cubic centimeters; and in 3, 500 cubic centimeters or more of blood was administered. Delay of blood replacement therapy until the postoperative period in cases of pulmonary bleeding has been recommended by some, but we believed that it was best to give these patients relatively large amounts of blood and plasma before and during surgery.

The injured side was kept down if there was much hemoptysis or paradoxical motion of the chest due to extensive rib fractures. Chest pain on cough or motion or pain elsewhere due to associated injuries was common if more than 6 hours had elapsed since the last dose of morphine. Restlessness was frequent because of pain and anoxia, so that some patients thrashed about in bed and attempted to remove the oxygen mask or catheter. Usually $\frac{1}{6}$ grain of morphine sulfate hypodermically or $\frac{1}{8}$ grain intravenously was given. Most patients disturbed from pain, dyspnea, anxiety, and the ambulance ride improved considerably after the first hour of

rest, oxygen, blood replacement therapy, reclining posture and sedation. Intercostal nerve blocks with 1 per cent procaine for pleuritic pain have been recommended but none was carried out in our series.

Physical examination of the chest and survey of the patient for other wounds were carried out as soon as practicable. It goes without saying that patients in severe shock should be turned as little as possible, but examination of the anterior chest may yield signs of hemothorax, pneumothorax, mediastinal deviation, paradoxical respiration, and subcutaneous emphysema.

Tetanus toxoid was given to American wounded on admission if it had not already been administered, and tetanus antitoxin was given to other wounded. The administration of penicillin in doses of 20,000 units given intramuscularly every 4 hours was started in all cases, and sulfadiazine, 1 gram every 4 hours orally, was prescribed except when there was vomiting or suspected abdominal involvement.

Severe or progressive dyspnea and mediastinal shift necessitated aspiration of air and blood in 9 of our patients during the preoperative period. Intubation of the chest for water seal drainage was necessary in the case of tension pneumothorax mentioned. However, there seems to be no reason to aspirate moderate sized collections of air or blood preoperatively in patients who are reasonably conditioned for surgery.

Aspiration of the stomach with a Levine tube was carried out preoperatively for dilatation in several cases and probably should have been done more often to decrease the incidence of vomiting in the period of recovery from anesthesia.

Diagnosis of abdominal involvement may be easy because of the position of the wounds of entrance or exit, presence of gastric content or bile in the chest wound drainage, hematuria or hematemesis. The position of a retained projectile in the roentgenogram with a visualization of its course is most important in difficult cases. Muscular rigidity and tenderness are rather unreliable signs of abdominal involvement since they are common on the wounded side in injuries of the lower thorax.

For this reason anteroposterior and lateral films of the abdomen were always made when any suspicion of abdominal involvement was entertained.

When a patient was out of shock and was not uncomfortable out of oxygen he was sent to have roentgenograms made. Anteroposterior and lateral chest films were made with the patient sitting up if possible. Occasionally it was necessary to take them with the subject reclining or supine and sometimes even through the litter when the patient's condition was poor. In 4 cases of severe perforating wounds it was thought best to forego x-ray examination because of the condition of the patients and the obvious extent of their injuries.

While sucking chest wounds had surgical priority it was thought that once they had been sealed and shock overcome it was time well spent to let the circulatory and respiratory mechanisms adjust themselves to the new situation. For example we believed that a delay after the administration of rather large amounts of blood and plasma was advisable before surgery was undertaken since another 2 or 3 hours probably have little effect in increasing the incidence of empyema and may well make the patient a better operative risk. In other instances the surgeon's hand may be forced by continued bleeding from the lung, chest wall or liver by the presence of evisceration of the stomach or intestine or by large sucking defects poorly controlled by dressings.

The length of time between injury and surgery in our series of cases varied greatly for many reasons but averaged 23.5 hours. The interval between admission and surgery ranged from 1 to 36 hours and averaged 10 hours. Some delay was often unavoidable of course because of the scheduling of other urgent cases.

ANESTHESIA

In most cases the patient was transferred from the litter to the operating table and a slow infusion of blood or plasma started. The patient was given 1/100 grain of atropine sulfate intravenously and 1/6 grain of morphine sulfate as well if he had had none in the past several hours. No morphine was given

to patients in poor condition however. Anesthesia was induced with a mixture of nitrous oxide, oxygen and ether with the patient supine or propped up slightly. After insertion of the endotracheal tube he was turned to the appropriate position for surgery. The anesthesiologist could now control respiration, the dressing could be safely removed and the skin prepared for operation. In patients with large hemothorax or those only recently out of shock turning, sometimes caused a sharp fall in the blood pressure and it was at this stage that the anesthesiologist had to watch his patient more closely.

Of the 64 men operated upon 43 received endotracheal ether and another 6 were given an ether-oxygen mixture with the anesthesia machine. The former was preferred because of the facility of controlling respiration in turning, an airway and aspirating blood and secretions during and after surgery. A large endotracheal tube was used without a Guedel cuff or pharyngeal packing about the tube. The positive pressure which could be exerted to reinflate the lungs during closure was therefore limited. However air was aspirated from the chest catheter for this purpose in some cases.

The anesthesiologist preferred to maintain a constant flow of 5 to 7 liters of oxygen a minute since this procedure seemed to give better oxygenation than the use of half a liter a minute with the closed system. Once the tube had been passed little ether was required and the patient was maintained in the upper plane of surgical anesthesia. During wound closure and transdiaphragmatic procedures he was kept deeper to insure quieter respiration.

Postoperatively the tracheobronchial tree was aspirated with a catheter in most instances and in several patients in whom there was considerable secretion and atelectasis bronchoscopic aspiration was carried out. In 1 case bronchoscopy was performed before insertion of the tube for the same reason. Patients in poor condition at the end of operation were kept on the table for an hour or more if this was feasible while the administration of oxygen and blood was continued.

While the use of sodium pentothal as an anesthetic agent is ordinarily contraindicated

in patients with anoxia or excessive tracheo-bronchial secretion it was used in combination with nitrous oxide and oxygen from the machine in 10 cases. Most of these were patients with small sucking wounds in whom there was little respiratory difficulty. The method was satisfactory in this selected group and its advantage lay in the time saved. It is not recommended for thoracotomy, however.

Three patients were operated upon under local procaine anesthesia. One of these had a severe thoracoabdominal wound with eversion of the stomach and large intestine and he was operated upon while in shock in an attempt to close the pleural and abdominal defects. In the other 2 cases there were small pleural openings which the surgeon succeeded in closing after intercostal nerve block and local infiltration.

OPERATIVE TREATMENT

Of the 70 patients with sucking wounds 64 were operated upon and 6 died without surgery. The operative treatment of this group of patients is divided into the repair of structures in the chest and abdomen and closure of the chest wall and the operations for additional unrelated injuries. Usually all surgery can be done at once but in severely injured patients it is sometimes wise to deal with the chest and abdominal injuries first and to postpone operations on the extremities, spine or head for 48 hours or longer.

Three principal types of thoracic operation were performed: (1) wound debridement and closure of the chest opening; (2) thoracotomy; and (3) thoracotomy plus transdiaphragmatic exploration of the upper abdomen.

Simple debridement of the wound with or without resection of a fractured rib and closure of the thorax was performed in 25 cases. This procedure was usually followed by aspiration of the hemopneumothorax with a syringe and large needle or the intubation of the chest for closed catheter drainage. The latter is indicated if a large hemopneumothorax or established infection of the pleural cavity is present and also if there is suspicion that tension pneumothorax may develop. In

of our cases the chest was not intubated until 4 hours after operation when the

wounds began to suck again because of inadequate closure. In 1 instance the lung re-expanded and the wound healed well after simple closed catheter drainage for 48 hours. In the other the patient had to return to the operating room for a thoracotomy.

In this group the pleural opening was frequently small and intercostal rib resection was performed in only 4 cases. Ten in all had serious associated wounds and in 4 patients laparotomy was also performed for abdominal injury.

This procedure of wound debridement and closure of the chest opening without exploration of the thoracic cavity is most applicable to the following types of wounds: first to small sucking defects, especially intercostal ones where the indications for thoracotomy are not present and second to thoracoabdominal wounds in which the major problem is in the abdomen with little or no lung damage and which usually occur if the missile has traversed only the costophrenic sinus before entering or leaving the abdomen. Here a laparotomy may be done plus debridement and closure of the chest wound with intubation or aspiration for the hemopneumothorax.

There was 1 death among these 25 patients an indication in most instances of the nonserious nature of the chest wounds involved rather than a recommendation of this type of operation. The patient who died had a large eversion of the stomach and colon through the abdominal wall with a small sucking chest wound. There was considerable hemorrhage with shock. He has been referred to above as one of the 3 patients operated upon under local anesthesia.

The indications for thoracotomy are enlargement of the existing pleural opening usually with resection of segments of one or more ribs to permit inspection and operative procedures within the pleural cavity are considered to be as follows: (1) any large sucking wound with fractures of one or more ribs; (2) suspected diaphragmatic hernia or perforation of the upper abdomen; (3) suspected continued bleeding from the intercostal vessels, the lung, internal mammary vessels, mediastinum or liver; (4) presence of large intrathoracic foreign bodies or indriven rib

fragments (5) suspected wounds of the trachea bronchi esophagus or heart and (6) clotted hemothorax

After debridement of the wound or wounds the thoracotomy incision is usually made at the site of the sucking wound parallel with the fractured rib. A posterior incision like that for a first stage thoracoplasty may be necessary for posterior wounds of the apex. A thoracotomy incision separate from the wounds of entrance or exit is in our experience seldom necessary or advisable.

Twenty three of the 64 cases belong in this second group. Rib resection was carried out in 21 of them and in 9 segments of more than 1 rib were removed. In the other 2 cases exploration was done through an intercostal incision. After hemostasis of the chest wall and insertion of a self retaining retractor blood and clots were evacuated from the pleural cavity and in pection was carried out with the aid of a lighted retractor. Lacerations of the lung were sutured in 6 cases. Suture was not thought necessary for small lacerations without any bleeding. Debridement of the pulmonary tissue except for removal of rib fragments and other foreign material was not performed in our series. Metallic foreign bodies were removed from the lung or pleural cavity in only 3 instances although a number of others were removed from the abdomen and chest wall. Unless a small missile (1 centimeter or less in diameter) could be easily found no time was lost in searching for it. Larger fragments were sought for and removed if possible and the incision in the lung sutured. Many of the wounds were perforating in type and the problem of foreign body removal was not present.

Closed catheter drainage was instituted in 10 of these 3 cases always separate from the thoracotomy incision. A No. 18 catheter was inserted and sutured to the skin usually in the 8th or 9th interspace posterolaterally or sometimes in the 6th interspace laterally. Closed drainage is a safeguard against respiratory embarrassment due to accumulation of fluid and air postoperatively. Breakdown of the closure and unrecognized acute empyema and nonreexpansion of the lung. In cases with gross contamination of the pleural cavity

60 000 to 100 000 units of penicillin were injected and the tube clamped for several hours. In some cases especially where postoperative tension pneumothorax is probable it may be wiser to insert anterior and posterior catheters.

Closure of the thoracotomy incision in layers was now carried out beginning with the parietal pleura and periosteum to either with the intercostal muscles. It is advisable to have at least a two and better a three layer muscular closure. Pedicled muscle grafts from the chest wall muscles were often sutured into the pleural defects which had not been completely closed with the first continuous double suture of No. chromic catgut. Additional muscle layers were then closed with interrupted sutures overlapping the first closure. Pericostal sutures were used a number of times. These were most useful in drawing together intercostal incisions when not necessary in our experience when rib resections had been performed. The subcutaneous tissues and skin were closed with loose interrupted sutures after a mixture of sulfanilamide and penicillin powder 4 parts to 1 had been dusted into the wound. The external wound of entrance and exit were left open only if the skin defects were too large to close or if the interval since wounding had been so long that infection seemed likely. Tight adhesive strapping was then applied over a vaseline gauze dressing.

There were 4 deaths in this group. Two of them were due to shock and hemorrhage immediately after operation. One man with bilateral hemothorax died of pulmonary edema 23 hours and another 3 hours after operation. In the latter case circulatory failure was probably precipitated by the administration of too large amounts of blood and plasma.

In the third group of 16 cases thoracotomy and transdiaphragmatic repair of upper abdominal structures were performed. Rib resection was carried out in 10 patients 2 of whom had segments of ribs removed and in 6 of whom the incision was intercostal. Suture of lung lacerations was done in 11 cases and removal of shell fragments from the lung in 11 instances.

The frequency of involvement of the various abdominal organs is interesting. The liver alone was involved in 8 cases, liver and kidney in 2, stomach and liver in 1, spleen and stomach in 1, spleen and kidney in 1, and the diaphragm alone with diaphragmatic hernia in 1. The other case illustrates how extensive these wounds can sometimes be. This patient had a sucking wound of the left lower chest through which gastric content was escaping. A thoracotomy was done first after resection of the 7th rib and transdiaphragmatic repair of a lacerated liver and 2 perforations of the stomach were carried out. After closure of the chest laparotomy was performed, 12 inches of jejunum resected and end to end anastomosis performed. In addition another jejunal perforation was closed and the transverse colon was exteriorized for multiple perforations. He had bile in the pleural fluid for several days but otherwise his immediate postoperative course was fairly smooth.

Five patients had a laparotomy as well as thoracotomy but it is of interest that 11 cases could be handled adequately from the thoracic approach alone. Actually splenectomy and repair of the upper portion of the stomach are more easily performed through the chest than through the abdomen.

Six of these 16 patients with sucking thoracoabdominal wounds in whom transdiaphragmatic operation was done died after operation, 4 of them within 5 hours after surgery as a result of traumatic and operative shock. Another died 40 hours after trans thoracic splenectomy and repair of a perforated stomach apparently of irreversible shock. The other death was due to anuria 8 days after nephrectomy suture of a severe liver laceration and closure of the open chest wound.

The subject of thoracoabdominal wounds is too large to consider in detail in this communication. To sum up, however, in the 10 patients with sucking thoracoabdominal wounds operated upon, 11 were subjected to thoracotomy and transdiaphragmatic procedures, only 5 had a thoracotomy plus laparotomy and 4 had a laparotomy with simple closure of the chest wound and aspiration or intubation.

POSTOPERATIVE MANAGEMENT

Oxygen therapy was continued on the ward in most of these cases with supportive treatment with blood and plasma as indicated. Gastric suction was started on recovery from anesthesia in cases of diaphragmatic hernia perforation of the stomach or intestine or in any other case with gastric distention or vomiting. Penicillin was continued in doses of 20,000 units intramuscularly every 4 hours usually for 5 to 7 days along with sulfadiazine 6 grams per day. The latter was usually omitted in nephrectomy cases and in abdominal injuries or other cases requiring gastric suction. Frequent turning, deep breathing, and cough were encouraged and morphine injections limited to 1/6 grain doses.

The chest catheter was ordinarily removed in 48 hours after injection of 40,000 units of penicillin in 20 to 30 cubic centimeters of normal saline. Its patency was checked every 6 or 8 hours by aspirating the airway needle of the water seal bottle or if necessary by irrigating the catheter with a little saline solution. If there had been gross contamination of the pleural cavity with gastric content or evidence of bile in the pleural fluid, catheter drainage was maintained for about 4 days. If an empyema appears, closed drainage must be continued.

Reaccumulation of serosanguineous fluid was usual but unless physical signs or chest films indicated a moderate effusion (i.e. greater than 200 to 500 cubic centimeters) it was not aspirated. If subsequent aspirations were necessary, penicillin in saline was introduced as before and the fluid was not replaced with air. In our series 18 patients were aspirated once postoperatively, usually on the 4th or 5th postoperative day, 6 were aspirated twice and 2 were aspirated 4 times in an attempt to re-expand the lung.

Anteroposterior and lateral chest films in the sitting position were commonly taken on the 4th or 5th day after operation except in the case of thoracoabdominal wounds where the physical signs were the guides, since it was thought best not to move these patients during the first week.

In sucking thoracic wounds as in other wounds involving hemothorax and lung col-

lapse early re-expansion of the lung is a prime consideration and this was encouraged by breathing exercise and by having the patient sit up over the side of the bed several times a day on the 4th postoperative day and thereafter. The latter procedure had to be omitted in the case of patients with thoracoabdominal wounds although they could be propped up on a back rest and deep breathing encouraged.

POSTOPERATIVE COMPLICATIONS

Postoperative shock was the principal complication and cause of death. It was evident in severe degree in 9 cases. Many of these patients had been in shock on admission and had improved enough to be operated upon but the additional factors of operative trauma and anesthesia proved to be too much for them. A few were operated upon while in shock who did not respond to treatment.

Atelectasis was first evident postoperatively in 5 cases, bronchopneumonia in 3 cases, severe pulmonary edema in 2 patients (both of whom died) and massive fatal pulmonary hemorrhage in 1 case. There were 2 instances of bronchopleural fistula; in 1 case the fistula closed after 4 days of water seal drainage and the lung had re-expanded a few days later; in the other a large pneumothorax remained in spite of repeated aspirations of air and the lung was still collapsed when the patient was evacuated a week later.

Two cases of wound disruption due to inadequate closure and failure to intubate the pleural cavity have already been mentioned. Some wound infection appeared in 3 cases but undoubtedly it occurred in other cases after they had left our hands since in most instances the debrided wound had been sutured at operation. The diagnosis of frank empyema was not made in any of these patients before evacuation but it was thought that at least several patients later developed it.

Drainage of bile from the operative wound complicated liver injuries in 3 cases and in 2 of these bile was present in the pleural cavity. In 1 case mild peritonitis was thought to be due to the presence of bile in the peritoneal cavity and in another to contamination of the peritoneal cavity by gastric content from a perforated stomach.

Abdominal distention was troublesome in 5 cases. The use of gastric suction in many of the thoracoabdominal cases probably kept this complication at a minimum.

There were three transfusion reactions of the hemolytic type in this series. This incidence can probably be attributed to the use of stored Type O blood without previous cross matching and to the rather large number of multiple transfusions given. Uremia occurred in 2 patients with kidney injury. One of them had had a nephrectomy and repair of a severe laceration of the liver and diaphragm.

In addition there was a temporary toxic psychosis in 2 patients probably precipitated by pain and anoxia. A cutaneous reaction to sulfadiazine was seen in 1 case and thrombophlebitis of an arm vein after prolonged intravenous therapy in 1 case.

EVACUATION

The average period of hospitalization before evacuation in our series was 6 days but varied from 3 to 15 days depending on the individual case and the military situation. Patients with laparotomy were kept for a minimum of 10 days. Occasionally military exigencies required us to evacuate our patients sooner than we ordinarily would have done and once we were obliged to transfer patients to the care of another hospital unit before they were ready for evacuation.

In general we kept patients with serious chest wounds for at least 6 days or more and those with thoracoabdominal wound for at least 10 days. It was thought that patients well enough to be evacuated at all could best be evacuated by air since the dangers of anoxia and expansion of a pneumothorax were not anticipated in air transport at low altitudes. Many of our patients were so evacuated.

RESULTS

Only the immediate results of treatment can be given since the final mortality and morbidity of these patients can be properly judged only after several months of observation. For the surgeon in the field however the question of immediate results is an important one. There are several factors which

affect operative mortality in these cases among them the length of time between wounding and admission which very often depended upon the military situation and the admission of a large number of other priority cases. The desire of the surgeon to do all he can for a badly wounded man in spite of poor response to shock therapy will increase the operative mortality. At the same time however such a tendency may favorably influence the overall total mortality. It is with the total mortality that we should be concerned since operative mortality varies with the estimation of operability. Experience has encouraged us to increase the operability rate. In this series 91 per cent of our patients were subjected to surgery.

Seventeen of this series of 70 patients with sucking wounds died and represent a mortality rate of 24 per cent. Six of them died without operation in from 4 to 24 hours after admission as the result of shock which did not respond to treatment. In 2 cases pulmonary edema was prominent and in 1 case morphine poisoning appeared to be most important. The 11 postoperative deaths in the 64 patients operated upon represent an operative mortality rate of 17 per cent.

Both the general mortality rate of 13.9 per cent and operative mortality rate of 7.6 per cent were less among 243 patients with penetrating and perforating nonsucking wounds of

the pleural cavity admitted during the same period. Likewise patients with thoracoabdominal wounds without open pneumothorax had a mortality rate half that of the sucking type.

SUMMARY AND CONCLUSIONS

1 Patients with sucking wounds of the chest make up an important part of the seriously injured casualties admitted to an evacuation hospital in a combat zone. The authors' experiences with 70 such cases including 21 with thoracoabdominal wounds have been presented.

2 Adequate preoperative preparation including the closure of the open pneumothorax with occlusive dressings, the treatment of shock and anoxia and the recognition of associated abdominal injuries is highly important.

3 Sixty-four patients were operated upon, an operability rate of 91 per cent. The indications for the various surgical procedures used have been reviewed.

4 Postoperative treatment is directed toward the correction of circulatory and respiratory disturbances, re-expansion of the lung and prevention of infection.

5 The overall mortality rate 24 per cent and the operative mortality rate 17 per cent were higher than those for other patients with penetrating and perforating wounds of the pleural cavity.

ELECTRODIAGNOSIS BY MEANS OF PROGRESSIVE CURRENTS OF LONG DURATION

Studies on Peripheral Nerve Injuries in Man

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THE relation existing between the rate of variation in current and the minimal strength of current required to produce excitation has been investigated by physiologists for many years since an attempt was made to study it by DuBois Reymond in 1862 Bernstein von Fleischl von Kries Fick Schott and Gildemeister were among the older investigators

Such so called progressive currents as have been studied may be divided into linearly increasing or progressive currents and exponentially increasing or progressive currents

Among the more recent investigators to whom more accurate methods of measurement have been available and who have studied exponentially rising currents may be mentioned Liberson Schriever Delville Cardot and Laugier d Hollander Solandt and Fabre In these experiments the duration of rise of the exponentially increasing current to its peak was less than one second often fifty to two hundred milliseconds In the more recent experiments on linearly increasing or progressive currents the longest period likewise was usually less than 1 second in the case of Lucas 1 seconds In 1907 Lucas published the results of his studies on the sciatic nerves of the toad and frog and on the sartorius muscle of the frog He found that the minimal rate of rise which he called the minimal current gradient in the case of the toad was of such an order that the luminal strength at instantaneous stimulation would have to be increased 46 times at the end of a second to produce an effective stimulus for the sciatic nerve of a frog the minimal strength at instantaneous

stimulation would have to be increased 6, times at the end of a second to be an effective stimulus Among his conclusions is the following statement

It is found that as current gradient is decreased the current strength required for excitation increases more and more rapidly until a definite minimal gradient is reached No gradient less steep than this will excite

The belief that progressive currents possessing less than a minimal rate of rise will not stimulate even though they finally reach a considerable value was likewise expressed by Hill From Lucas experiments Blair reached the conclusion that when the gradient is too low for the rheobase to be effective no voltage is effective

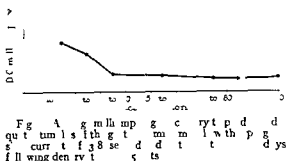
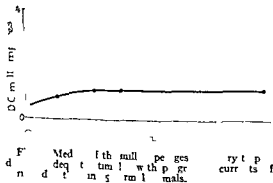
In an analysis of Solandt's data obtained from stimulation of the frog's sciatic nerve with exponentially rising currents it may be seen that with a minimal gradient the current increases at a rate such that a value 16, times the rheobase value is reached in 0.27 second

In a former publication some of us (23) showed that when progressive currents of long duration 1.2 2.6 3.8 and 8.8 second are used as stimuli for normal cat muscle we were unable to confirm the existence of the luminal gradient In the case of the normal muscle the luminal current at instantaneous stimulation or the rheobase was 0.4 milliampere at 1.2 seconds the current was 0.8 milliamperes or twice the rheobase at 2.6 seconds 1.0 milliamperes or 2.6 times the rheobase at 3.8 second 1.1 milliamperes or 75 times the rheobase (Fig 1) At no time was the rheobase current adequate to stimulate yet with a current of long duration 8.8 seconds an increase of only .87 times the rheobase was an effective stimulus

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In earlier years the impetus for development of new wave forms of stimulation was the desire to imitate the normal contraction of a muscle and to avoid the abrupt movement produced by sudden closure of a current whether faradic or galvanic (Bergonie) In 1907 Bordet described an apparatus for the production of a galvanic wave current lasting as long as 2.5 seconds With regard to diagnosis he noticed that when a muscle is degenerated the time necessary to reach a current adequate for stimulation is long as compared with that necessary for normal muscle with which the liminal current must be reached more quickly For similar reasons Laquerriere designed a new apparatus on the basis of the work of Bergonie In 1912 Becker described an apparatus called a myomotor which delivered saw tooth waves In 1931 Delherm and Laquerriere described an apparatus which delivered alternating currents of long duration and unidirectional galvanic wave forms The currents described by Bordet Laquerriere and Delherm Duhem designated as currents of long period to distinguish them from currents described by d'Arsonval in 1891 and by Lapicque who without knowledge of the work of d'Arsonval published his results in 1915

Whereas the currents designated as those of long period may last several seconds those designated as progressive currents by Delherm last only a fraction of a second From the standpoint of their contribution to diagnosis it is said of both types that a degenerated muscle will respond to the condition in which a liminal current is reached more slowly whereas with the normal muscle this amperage must be reached more quickly



Although many articles in the literature are concerned with progressive currents of long period (more than 2 seconds) the clinical material from which data have been obtained is small No accurate measurements of time and current are described and no experimental work is recorded

It is necessary we believe better to define a progressive current We take such a current to be one which increases with time The kind of progressive current is determined by its wave form for example whether linear exponential or sinusoidal The progressive current used in our former experiments was a linearly increasing one consisting of the ascending limb of a unidirectional galvanic wave of isosceles triangle type The decision to use a current wave of this type in preference to a saw tooth wave was based on several considerations In the first place one is able to observe a contraction at the peak of the wave Also one is able to obtain simultaneous readings of the voltage and strength of current at the instant of the contraction In addition one is spared the confusion resulting from unwanted break contractions which are likely to occur with the saw tooth wave

As the result of former experiments we showed that in the cat within a few days after denervation the amount of current necessary to excite the muscle by progressive currents of long duration was usually somewhat higher than the amount required by the normal muscle It began to diminish after about 10 days and between 30 and 40 days it was less than normal and remained so as long as the animal was studied

It was seen that as long as 203 days after denervation the rheobasic current being 0.18

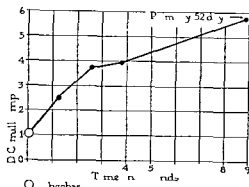


Fig 3 Millamp g necessary t p o d d q t
 tum l f t h g t m i m c l f cat 5 d ys
 aft prim y t d 4 days ft p ns cha t
 st f d r v t e d m l h b f d

milliampere contraction occurred at 8.8 seconds with 0.27 milliampere (Fig 2)

In contrast to the period of denervation at times before and sometimes coincident with evidence of motor return the amount of current necessary to produce excitation must be increased considerably above the rheobase when the current is allowed progressively to increase for long period. Thus in Figure 3 4 days prior to the recorded examination made 52 days after primary suture the muscle reacted as a denervated one. On the 52d day the rheobase was 1.15 milliamperes at 1.2 seconds contraction occurred with 2.5 milliamperes at 2.6 seconds with 3.75 milliamperes at 3.8 seconds with 4 milliamperes and at 8.8 seconds with 5.75 milliamperes. As regeneration progresses the amount of current necessary for excitation becomes even greater and a normal pattern is not reached even when fairly good motor recovery has taken place (Fig 3).

Soon after we had begun to examine muscles supplied by injured peripheral nerves in man it was found that the use of absolute values of the threshold ampere for progressive currents of long duration to indicate denervation and regeneration might lead to misinterpretation in some cases. The reason for this is found in the fact that when the rheobase is high the threshold ampere for progressive currents must be higher therefore when as the consequence of edema or other changes in the tissues the rheobase or threshold current for instantaneous stimulus

is high the threshold ampere for progressive currents must be higher therefore when as the consequence of edema or other changes in the tissues the rheobase or threshold current for instantaneous stimulus is high the threshold current for progressive current of long duration must be still higher. As a result in some cases when a muscle is denervated the absolute value of the threshold ampere of progressive currents of long duration may be high in others low.

From data described in preceding paragraphs it may be seen that the ratio between the rheobase and the threshold ampere of a progressive current lasting 8.8 seconds was 2.87 in the normal muscle of a cat 15 for a denervated one and 7.7 for the recovered muscle 52 days after suture. When therefore one finds a muscle with a high rheobase it is necessary to determine the ratio between the rheobase and the threshold current for stimuli by progressive currents of long duration. This ratio may be called the ratio for progressive currents to distinguish it from the tetanus ratio for instantaneous current stimulus.

The ratio for both cathodal and anodal stimuli should be obtained since as will be seen the approach toward unity of the polar ratios for progressive currents is characteristic of the state of denervation of a muscle.

The evolution of the changes in this ratio as well as the threshold current as related to the time following section and suture of the sciatic nerve in the cat is constant and characteristic. These changes may be divided into four periods. The first during the very early period of degeneration occupying about 14 days the second during the remaining period of degeneration until the period of complete denervation had occurred from the 31st to the 49th day the third the period of denervation and the fourth the period of regeneration beginning from the 40th to the 60th day.

During the first 4 days a number of changes occur the significance of which we do not at this time know. They consist of two phenomena first a very rapid fatigability to progressive currents and a failure to contract when the current is increasing but a contraction when after a current has reached its peak it

approaches zero. Exclusive of this very early change the responses during the period of degeneration and regeneration have a remarkable similarity. During degeneration there is a rapid increase in threshold current both for anodal and cathodal stimuli by progressive currents of long duration reaching a peak at variable times usually from the 17th to the 23rd day. At the same time there is an increase of the ratio of progressive current both for anodal and cathodal stimuli but usually in contrast to the period of degeneration the increase in the ratio is much greater than the increase in threshold current. Then both the threshold current and ratio continue to diminish until the period of complete denervation occurs. At this time the threshold current is at a minimum both for anodal and cathodal stimuli and the ratio often is at unity or a little more both in the case of anodal and cathodal stimuli. When regeneration occurs there is a relatively sudden increase in threshold amperage for both anodal and cathodal stimuli and also a marked increase in the ratio both in the case of anodal and cathodal stimuli (Fig. 4). During the very early stage of regeneration the same peculiar reactions as were seen during very early degeneration are at times noted particularly failure to contract when the current is increasing and response when after having reached its peak the current has returned to almost zero.

The state of denervation is readily demonstrable by the approach to unity of the ratio and minimal threshold current as well as the approach to unity of the polar ratio. If one does not take into account the time which has elapsed since the date of injury so that an opinion may be derived as to whether the state of denervation should be present were the nerve severed or completely injured then from the data of a single examination there might be some difficulty in differentiating the increase of threshold amperage and ratio found during degeneration from that found during regeneration. Usually although the ratio is high in both the threshold amperage is much lower during degeneration than regeneration. Thus it may be said that when the threshold amperage is only moderately high and the ratio quite high we are dealing

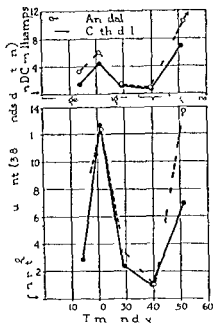


Fig. 4. Milliamperes of threshold current of the trochanteric muscle of the cat during progressive current stimulation. The ratio of progressive current to threshold current is indicated by the solid line. The ratio of progressive current to threshold current is indicated by the dashed line.

with the changes of degeneration. When both threshold amperage and ratio are high we are dealing with regeneration.

Although we have found this to be true in our experimental work on the cat we have found an occasional exception in man when the threshold amperage as well as the ratio was high and even higher during degeneration than regeneration. However if sufficient time has elapsed for complete denervation to have taken place then a high threshold amperage and high ratio indicates recovery. If at one examination a liminal threshold amperage and a ratio approaching unity and an approach to unity of the polar ratio are found and at a subsequent examination a high threshold amperage and high ratio are found recovery is indicated.

CLINICAL APPLICATION

Although unequivocal evidence for the state of denervation and recovery in experimental lesions of the sciatic nerve in the cat has been adduced by data obtained from stimuli by progressive currents of long duration the

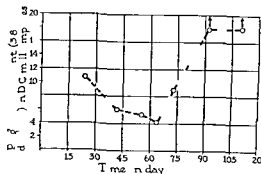


Fig 5 Thresh ld rr t th hum t b l t u
muscl t n us d ys f l w n j ry d se f
th pe l ry h p ress t f 3 8
p d t d e d to e d t f th se red
p l d d 6 d ys ft j y

validity of this method of diagnosis must be tested by its application to injuries of the peripheral nerves in man.

We have examined over 30 cases with lesions of various peripheral nerves about half of these were civilians and the others wounded soldiers examined at the Percy Jones General Hospital at Battle Creek, Michigan.

The evolution of the changes in threshold amperage and ratio for progressive current stimuli in time after injury to a peripheral nerve injury in man is the exact counterpart of that in the cat.

Exclusive of the very early changes observed in the cat in man after the 14th day following severe injury there is a rapid increase in threshold amperage for anodal and cathodal stimuli by progressive current of both 1 and 4 second duration. This is succeeded by a progressive diminution in threshold amperage until the period of denervation is reached when it is at its minimum and the polar ratio approaches unity. Then when recovery occurs there is again a rise in threshold amperage usually of a much higher order than was the case during the period of degeneration. This may be illustrated by the chart plotting the measurements obtained in a case of peroneal nerve severed by a knife blade at varying days following injury and cure (Fig 6).

In addition there is a parallel change in the ratio derived by dividing the rheobase of anodal and of cathodal stimuli respectively into their threshold current. At first there is a

rise in the ratio for stimuli of both 1 and 3.8 or 4 second duration then a diminution until at the period of denervation the ratio approaches or is at unity and the polar ratio also approaches unity. Then when recovery occurs the ratio increases usually to a degree as high often higher than during the period of degeneration. This may be illustrated by a graph plotting the ratio for stimuli of 1 and 3.8 or 4 second duration in a case of Bell's palsy beginning 27 days after its onset (Fig 6).

During the period of denervation a unity is approached or even is for the threshold amperage and the ratio for stimuli of 1 or 4 seconds duration. On the other hand during degeneration and regeneration the threshold amperages and ratio for stimuli of 1 and 4 seconds duration respectively differ those for the stimulus lasting 4 seconds being higher. This may be seen in Figure 7.

When it is possible to examine a patient who has sustained an injury to a peripheral nerve at frequent intervals throughout the whole period of time from that of injury to that of recovery the validity of a method could quickly be determined. Unfortunately we have been able to do this only in a few cases among the civilian population.

More frequently we had the opportunity to examine patients but once or twice at some period of time following injury or operation. This was particularly true of the cases of wounded soldiers. Certain other standards however can be established for the validity of this method in such cases. In the majority of cases we did not have the opportunity of examining the patient until a time had elapsed

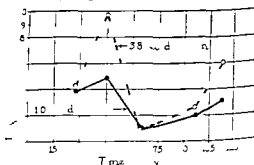


Fig 6 Th p gress curre t t f d f 3 8
sec d d u t ry g d ys f l g th set f
mpl t B l palsy

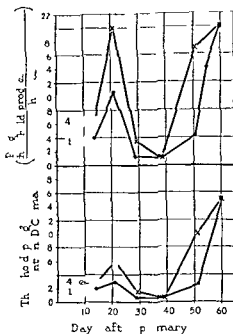
which either resulted in a state of denervation or a state of recovery from a severe lesion

When the characteristics of a state of denervation in a muscle had been found the validity of such a diagnosis could be assessed by the following means First that at operation preceding the examination by a number of days insufficient for regeneration to occur the nerve end were found to be severed Second that subsequent operation revealed a severed nerve Third when a state of denervation was found in a patient in whom operation was not performed spontaneous recovery later occurred at a time compatible with regeneration and was made evident by the characteristic changes in threshold amperage and ratio or later recovery of motion or sensation or both Fourth when in some of the muscles supplied by an injured nerve characteristics of recovery are found by examination with progressive currents of long duration and in another or others characteristics of denervation these muscles later at a time compatible with regeneration show characteristics of recovery of muscles as found by examination with progressive currents or recovery of motion or sensation or both Fifth the characteristics of regeneration follow those of denervation at a time when regeneration could have occurred

When the characteristics of a state of regeneration or recovery had been found the validity of such a diagnosis could be assessed by the following means First that at operation preceding the examination the nerve was found not to be severed or completely compressed Second that at subsequent operation the nerve was found not to be severed or completely compressed Third that motor or sensory recovery ensued Fourth that motor or sensory recovery was present at the time of examination Fifth when some of the muscles supplied by a nerve showed the characteristics of recovery later recovery of motion and sensation occurred

RESULTS OF PERIPHERAL NERVE INJURIES IN MAN

In 36 patients at one time or another in the course of recovery after a peripheral nerve lesion examination by progressive currents of long duration showed the characteristics of a



F 7 Thr b l d p gress: cur t and t s f
d 4 ds d ti in th gastroc emus m scle t
rying d ys f li r g p m ry s t f th sci ti
th t

recovering nerve muscle complex The confirmation of the validity of this electrical sign consisted in one case of an exploration a short time before examination which revealed no severance of the nerve in another exploration soon after examination showed no discontinuity of the nerve In 4 there was subsequent clinical evidence of recovery of motion or sensation or both In 8 clinical signs of recovery of motor or sensory function were present at the time of electrical examination In 2 the validity of the characteristics of recovery consisted of their appearance after the electrical signs of denervation had been present and a period of time compatible with recovery ensued This progression from the electrical signs of denervation to those of regeneration were also found in 7 other patients in whom the validity of the electrical signs of regeneration were confirmed by the fact that at an exploratory operation performed a few days before the examination the nerves were found severed in 6 cases In 1 case a hypoglossal facial anastomosis had been performed before the examination In 6 later recovery

of motor or sensory function followed the appearance of electrical signs of recovery at a time compatible with recovery. Three of these had also been confirmed by the findings at operation. In these occurred recovery of motion or sensation or electrical signs of regeneration at a later date which was compatible with recovery.

There were 4 cases in which the rheobase was so high in 140 milliamperes that examination by progressive current was impossible both because of insufficient output of current and if available such currents would be unbearable. That such a high rheobase is a sign of recovery was found from the fact that later clinical evidence of recovery of motion or sensation or both was found in all cases and in 1 electrical examination conducted 82 days later revealed the characteristics of recovery and motor recovery had begun.

In 4 cases electrical signs of recovery were found but at clinical examination 80, 130, 97 and 90 days respectively after injury no motor or sensory recovery was demonstrated. However it is quite probable that such recovery will take place. In 1 case electrical signs of recovery were shown to be present only 36 days after suture of a peroneal nerve although this is quite early nevertheless we felt that it is quite possible that the nerve is recovering.

In only 2 cases was the method brought into question. In both the deep branch of the radial nerve was injured. In 1 the electrical examination was performed 140 days after injury and again 14 days after operation which revealed that the nerve was severed. In the other the electrical examination was conducted 12 days after operation which revealed a severance of the deep branch of the radial nerve. The operation was performed 93 days after injury. Only one muscle had been examined in each of these cases. Here we feel it is quite possible that some new fibers had found their way to the distal segment.

Of 5 patients examined when electrical signs of recovery occurred the later course confirmed their validity in all but 7 cases in 5 the time which elapsed from the date of suture or injury may well be too short for motor or sensory recovery. In 2 only was

there an equivocal result. In all of the instances when the electrical signs of denervation were found there was a confirmation of the validity of this electrical sign.

DISCUSSION

The indication for the development of methods of electrodiagnosis other than by examination by stimuli of galvanic and faradic current as described by Erb is found in the failure of such methods as ordinarily performed to give accurate evidence of the states of denervation and regeneration. Some of this inaccuracy is the result of imperfect knowledge of the difference in the responses during denervation and regeneration. Some is the result of incorrect views which have been passed down in text books and literature and part due to limitations of such methods.

The state of complete denervation of a muscle can with assurance be determined by such methods both by the very small threshold amperage or rheobase and the approach toward or to unity of anodal and cathodal clearing stimuli or unity of polar ratio. In the other states of denervation and regeneration are then recognizable by the absence of the characteristics described. However it would be difficult to differentiate the degeneration from the regenerating state. Although the existence of response to faradic current 14 or more days after a lesion indicates a potentially recoverable lesion this method is of little value in war wounds. Such lesions recover in a short period of time and by the time a wounded man would have reached a hospital suitable for nerve surgery recovery of motion or sensation or both would have occurred. On the other hand in a spontaneously recovering but severely injured nerve other clinical signs of recovery usually antedate the response to faradic current.

Although our former work on stimulation by progressive currents of long duration indicated clearly that the relatively rapid increase of threshold amperage was an accurate indication of recovery further work upon human material showed that this was not in itself a safe indication. The reason for this was found in the fact that in some cases because of edema and other subcutaneous changes a high

threshold amperage may be present only because the rheobase or threshold amperage for instantaneous stimuli of infinite duration was also high. It was therefore concluded that determination of the ratio for progressive currents of long duration was a necessary part of the examination. This is the ratio between the threshold amperage of a progressive current of any given duration and the rheobase both for anodal and cathodal stimuli.

We have shown that the characteristics of response to progressive currents during degeneration consist of (1) some unexplained peculiar responses very early during degeneration usually within the first 14 days consisting of contraction when the current has reached zero from a peak, (2) a subsequent early rise in threshold amperage and in ratio both for anodal and cathodal stimuli, (3) a fall in both as the state of denervation is approached during all this time there is a disunity between anodal and cathodal stimuli. During denervation the characteristics of changes occurring consist of a minimal threshold amperage, an approach toward or to unity of anodal and cathodal stimuli and a unity of the ratio for progressive currents both in the case for anodal and cathodal stimuli. When regeneration occurs during a very short time the characteristic changes are fleeting responses only when the current has reached zero from a peak, then a sudden increase in threshold amperage for progressive currents usually much higher than in the degenerating state, a very high ratio and a disunity between anodal and cathodal stimuli.

In interpreting the results of examination by progressive currents of long duration it is found that the characteristics of the state of denervation are unique for that state. Both during some time of degeneration and during regeneration a high threshold amperage for progressive currents and ratio is present. However, a high ratio and only a moderately high threshold amperage are found during the state of degeneration and a very high ratio and also threshold amperage during regeneration.

The time which has elapsed from the date of injury or surgery must also be taken into consideration. When a sufficient time after injury has elapsed to permit the development

of the state of denervation and the characteristics of denervation not found, the nerve is spontaneously recovering and should not be operated upon. If after a suture of severed ends of nerves characteristic of the denervated state are not found, one may be certain recovery is taking place. When a sufficient time has elapsed after injury to a nerve to have permitted regeneration and the characteristics of denervation are found, the nerve must be operated upon.

Although the characteristics of the regenerating state indicate that some nerve fibers have regenerated and reached the muscle being examined, this does not predicate complete recovery of other muscles supplied by the nerve involved. More accurately to predict the completeness of recovery, all of the principle muscles supplied by such a nerve must be examined. At times proximal muscles may show the characteristics of regeneration, for example the flexor sublimis digitorum and flexor profundus digitorum and the flexor carpi radialis in a median nerve lesion and the abductor brevis pollicis and opponens pollicis show the characteristics of denervation. In such a case the later appearance of the characteristics of regeneration in the latter muscles would lead to a good prognosis.

For the most part a high rheobase at a time when if a nerve would have degenerated completely, were it severely injured or severed, indicates recovery. When such a rheobase is so high that examination by progressive current is impractical either because sufficient amperage would not be available or because of the painfulness of the very high order of current necessary, further examination is needed. This should consist of determining whether the anodal and cathodal closing stimuli are at or near unity and whether the ratio between the tetanus produced by instantaneous stimulus by strong currents of infinite duration or square waves and the rheobase also approaches or is at unity. When these characteristics are found despite the high order of the rheobase, the muscle is in a state of denervation. The necessity for this additional examination, however, rarely occurs and when it does, ordinarily characteristics of regeneration will be found.

These electrical signs of recovery have been found to precede clinical evidence of motor or sensory recovery for variable times. In some instances the interval was quite long in one it was 150 days

CONCLUSIONS

1 The characteristics of responses to progressive currents of long duration during denervation denervation and regeneration are described

The usefulness of the computation of a ratio for currents of long duration is pointed out

3 The characteristics of the state of denervation as described are unique for that condition and consist of a minimal threshold amperage for contraction and unity of ratio for stimuli by progressive currents of long duration

4 A very high ratio or a very high threshold amperage are indicative of regeneration

5 A high ratio and only a moderately high threshold amperage are characteristic of the degenerating state

6 The validity of this method of examination for the diagnosis and prognosis of peripheral nerve lesions in man was established by the examination of 5 patients suffering from peripheral nerve lesions. In only 2 cases was there any question of its accuracy and for the first a possible explanation is made

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THE EFFECT OF COTTON AND CATGUT IN HERNIAL REPAIR ON POSTOPERATIVE TEMPERATURE AND PAIN

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AN Army Hospital offers an unusual opportunity to study wound healing in a standard group of young men who are well fed, well muscled, and otherwise in good health. Therefore, an analysis was made of the inguinal hernia operations done with either catgut or cotton sutures at the A. A. F. Regional Hospital, Truax Field. This study was done in order to determine whether any completely objective measurable evidence could be found to support the use of one type of suture material over the other.

The clinical impression that wounds which are closed with nonabsorbable sutures heal more readily than do those closed with catgut is in accordance with the writings of Kocher, Halsted, Whipple, Shambaugh, and Howes, and Harvey, also the clinical impression that cotton excites a less reaction in a wound than does silk is in agreement with the work of Mead and Ochsner.

Direct, completely objective, unbiased measurement of the degree of postoperative reaction excited by certain suture materials in groups of human patients is not practical to obtain. Indirect methods are of value if applied to a sufficiently large, well standardized group of cases. These methods have been used in cases in which wounds have been closed with catgut and cotton sutures by measuring (1) the temperature reaction and (2) the narcotics and sedatives required for relief of postoperative pain.

CASES ANALYZED

Groups of herniorrhaphies, standardized except for the suture material, were analyzed (Table I). Approximately half of the cases were repaired with cotton and half with catgut. No recurrent hernias were included in the series. The differences in average age, height, and weight of patients represented in the groups were not significant (Table III). The operations were performed by a number of surgeons, including residents in training. No one surgeon did enough of the operations in any group to affect the statistics appreciably by his skill or lack of skill. The average operating

time in the cotton and catgut groups was not significantly different (Table III). All operations were performed under spinal anesthesia with 8 exceptions. In 1 general anesthesia supplemented the spinal in 7 general anesthesia was used throughout. The postoperative reactions in these 8 cases are within the normal distribution for the groups and do not affect the final averages.

Following operation, these patients were returned to the various surgical wards without distinction as to the type of suture material used. Because these soldiers were young and in good general health, it was possible to employ routine orders in all cases during the immediate postoperative period. The nurses had no knowledge of the type of suture material used, so the drugs were administered as required by the patient's own subjective reactions. Since the cases were analyzed over a considerable period of time, many different nurses cared for these patients. Therefore, if any nurse had personal prejudice as to the giving of drugs postoperatively, her feeling would not appreciably affect the results in the series. The postoperative temperatures of patients were factual, affected only by the patient's physical status. All patients developing any type of postoperative complication were excluded from the final analysis.

In this study, 163 unilateral and 50 bilateral inguinal herniorrhaphies were reviewed (Table I). Eighty-three of the unilateral hernias were repaired with cotton. Five of these cases were excluded from the final analysis due to postoperative complications which were pulmonary 1 case, upper respiratory infection 3 cases, scarlet fever with secondary deep stitch abscess 1 case. Eighty unilateral hernias were repaired with catgut. Eleven of these cases were excluded due to postoperative complications which were pulmonary 3 cases, stitch abscesses 3 cases, wound infection 2 cases, upper respiratory infection 1 case, scarlet fever 1 case, hematoma in the wound 1 case. Twenty-five bilateral hernias were repaired with cotton. Seven cases were excluded due to postoperative complications as follows: pulmonary 4 cases, hematoma in wound 2 cases, stitch abscess 1 case. Twenty-five bilateral hernias

From the Surgical Service, A. A. F. Regional Hospital, Truax Field, Madison, Wisconsin.

TABLE I—HERNIORRHAPHIES ANALYZED

	Co		Ca gu	
	Unila	Bilateral	Unilateral	Bilateral
Number of cases	83	5	80	
Cases lumina d (pos peria plications)				5
Normal	8	8	69	
Cord ans l ed buta	5			
Cord la ed (Bass)				3
Cord ns l d	3	4		7

were repaired with catgut. Five were excluded due to postoperative complications which were pulmonary, 2 cases upper respiratory infection, 1 case incision into bladder at operation, 1 case mild wound infection, 1 case.

After all cases with postoperative complications were excluded, there remained for analysis 78 unilateral and 18 bilateral hernias repaired with cotton and 69 unilateral and 0 bilateral hernias repaired with catgut. Several different types of repair were done. The type of hernia repair was not found to have a statistically significant effect on the final results in this study.

There was no significant difference in the average age, weight and height of the patients having cotton and catgut unilateral herniorrhaphies. Likewise, the difference in operation time was not striking. The same was true for the bilateral herniorrhaphy groups (Table II).

TABLE III—UNILATERAL HERNIORRHAPHIES
STATISTICAL ANALYSIS OF POSTOPERATIVE TEMPERATURES

Postoperative day	Average temperature		Difference in means (°)	Difference in standard deviation	Remarks
	Cotton	Catgut			
Day 1	98	99			St
Day 2	99	99			S
Day 3	99	99	0.4		S
Day 4	98	99	0.6		S
Day 5	98	98			S
Day 6	98	98			S
Day 7	98	98			S
Day 8	98	98			S

F = F, rplana l, ta l, cs see C, to F, E, and Co, den D, J
A = Age, Ge = Ge, S = Sex, an = an, h = h, lev = lev, f = f, Pre = Pre, gu = gu, can = can, has = has, bee = bee, hose = hose
A = h level

TABLE II—ANALYSIS OF COMMON FACTORS

Hernia	Side	Area	Average	Average	Average	Number of cases
Unilateral	Cotton	5.4	6.6	5.9	4.4	1
	Catgut	6		5	5	69
Bilateral	Cotton		6		8.6	
	Catgut					18

POSTOPERATIVE TEMPERATURES

Postoperative temperature curves were determined for each of four groups in order to compare the unilateral cotton to the unilateral catgut herniorrhaphies and the bilateral cotton to the bilateral catgut cases. These curves were determined by taking the highest daily postoperative temperature of each patient in each group until normal temperatures persisted. The average daily postoperative temperature was then calculated for the group. As expected, the average temperatures of the unilateral groups were lower than those of the bilateral groups.

The difference between the temperature curve of the unilateral cotton herniorrhaphies and the unilateral catgut herniorrhaphies was striking (Fig. 1). The average temperature on the first postoperative day was 99.4 degrees F for cotton as compared to 100.0 degrees F for catgut. Furthermore, a normal average temperature was attained in the cotton cases on the fourth postoperative day, compared to the sixth postoperative day for

TABLE IV—BILATERAL HERNIORRHAPHIES
STATISTICAL ANALYSIS OF POSTOPERATIVE TEMPERATURES

Postoperative day	Average temperature		Difference in means (°)	(N)	Level of significance	Remarks
	Cotton	Catgut				
Day 1	98.8	98.8				NS
Day 2	99	99		8		PS
Day 3	99	99				S
Day 4	98	99.6			28	S
Day 5	98	99			83	S
Day 6	98	99		8		S
Day 7	98	98			83	S
Day 8	98.6	98		8	88	S

F = F, Sta = Sta, ha = ha, f = f, to = to, l = l, F = F, he = he, test = test, see = see, Applied = Applied, Pre = Pre, Hall = Hall, luc = luc, gu = gu, can = can, b = b, g = g, can = can, Significant

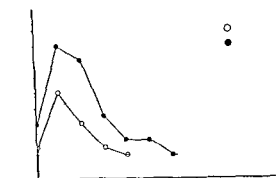


Fig. 3. Temperature curves for unilateral herniorrhaphy groups. The catgut curve is consistently higher than the cotton curve, indicating higher postoperative temperatures.

the catgut cases. These figures are of statistical significance (Table III).

Temperature curves which were similar but of greater magnitude were found in the bilateral herniorrhaphy groups (Fig. 2). The average temperature for the first postoperative day was 99.9 degrees F for cotton as compared to 100.4 degrees F for catgut; second postoperative day, 99.7 degrees F for cotton, 100.6 degrees F for catgut; third day, 98.9 degrees F for cotton, 99.6 degrees F for catgut. Furthermore a normal average temperature was attained in the cotton cases on the fifth postoperative day, as compared to the seventh postoperative day in the catgut cases. The statistical significance of these figures is shown in Table IV.

NARCOTICS AND SEDATIVES

The amount of narcotics and sedatives given postoperatively was now determined for the four

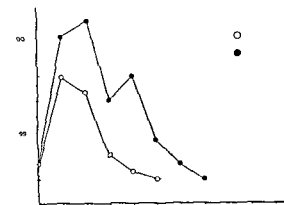


Fig. 2. Temperature curves for bilateral herniorrhaphy groups. The catgut curve is consistently higher than the cotton curve, indicating higher postoperative temperatures.

groups. This was done in order to compare the subjective discomfort of the unilateral cotton to the unilateral catgut herniorrhaphies and the bilateral cotton to the bilateral catgut herniorrhaphies. The average number of doses of each drug per patient was determined (Fig. 3). Patients with unilateral hernias repaired with catgut required nearly twice as much narcotic as those repaired with cotton. It seemed evident therefore that the postoperative course following catgut herniorrhaphies was more painful than that following cotton herniorrhaphies. In the place of narcotics the patients in the cotton group used nearly twice as much sedation as did the patients in the catgut group. This fact was evidence of restlessness rather than pain. The statistical significance of these figures is outlined in Table V.

TABLE V.—UNILATERAL HERNIOTOMIES
STATISTICAL ANALYSIS OF NARCOTICS AND SEDATIVES

Narcotics and sedatives	Average dose per patient		Difference in mean (t)	Difference in standard deviation	Remarks
	Cotton	Catgut			
Codine		60	6	6	NS†
Morphine		4			S†
B. B.			00	58	S

* With 5% level of significance has been shown. A. H. Levitt.

† S. N. Significance. P. S. P. Significance. B. B. Significance.

TABLE VI.—BILATERAL HERNIOTOMIES
STATISTICAL ANALYSIS OF NARCOTICS AND SEDATIVES

Narcotics and sedatives	Average dose per patient		Difference in mean (t)	(N)	Remarks
	Cotton	Catgut			
Codine		4		4	NS†
Morphine	3	8		8	PS†
B. B.	4		60	8	S†

† S. N. Significance. P. S. P. Significance. B. B. Significance.

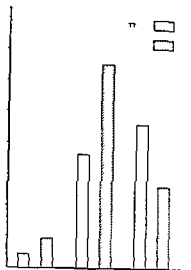


Fig 3 Grouping of patients used in postoperative study of herniorrhaphies treated with catgut.

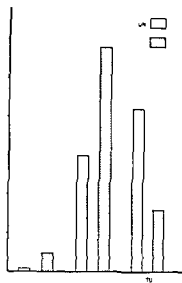


Fig 4 Grouping of patients used in postoperative study of herniorrhaphies treated with catgut.

In the bilateral herniorrhaphy groups the findings closely paralleled those in the unilateral groups. As expected there was a greater but proportionate increase in the drugs needed (Fig 4). The statistical significance of these figures is outlined in Table VI.

EVALUATION OF STUDY

This study of the immediate postoperative convalescence of uncomplicated herniorrhaphies showed that the patients with cotton repaired wounds had less general reaction than patients with catgut repaired wounds. This fact was evidenced by a lower daily temperature and a quicker return to normal by the cotton group. Postoperative temperature is not due to suture material alone. In this study however other factors which might influence postoperative temperature were controlled in the compared groups. The only important difference between the group was the suture material used. There is no way to determine how much of the postoperative temperature in the cotton repaired groups was due to suture material and how much was due to other factors. It is reasonable to deduce however that the statistically significant difference of postoperative temperature in the catgut groups compared to the cotton group was due to the difference in suture materials. As has been shown this difference is definite and significant. These data substantiate the laboratory and clinical findings that wounds sutured with cotton show less post-

operative induration and faster resolution of the induration than wounds sutured with catgut.

The study also indicated that patients with cotton repaired wounds had a more comfortable postoperative convalescence as evidenced by the fact that patients with catgut repaired wounds required more narcotics. In contrast the patients with cotton repaired wounds were able to rest with a sedative instead of a narcotic. These findings are in keeping with the impression that the more marked induration in the catgut repaired wounds was associated with more tenderness to the wound area and increased subjective discomfort on the part of the individual patient.

By the time this series of cases had been completed the surgeons of this general surgical service were in unanimous agreement that wounds repaired with cotton showed less postoperative induration and seemed less painful than wounds repaired with catgut. For these reasons the catgut repair of hernia has been discarded on this surgical service.

SUMMARY

In this study 63 unilateral and 30 bilateral inguinal herniorrhaphies in otherwise healthy young males were reviewed to determine the advantages of either catgut or cotton suture material. All cases with postoperative complications were excluded from the final analysis. There remained 78 unilateral and 18 bilateral herniorrhaphies repaired with cotton and 69 unilateral and 22 bilateral herniorrhaphies repaired with catgut.

A comparison of the postoperative temperatures revealed that patients with unilateral or bilateral herniorrhaphies sutured with cotton averaged a lower daily postoperative temperature which returned more quickly to normal than patients undergoing similar procedures in which catgut sutures were used.

A comparison of the postoperative narcotics and sedatives administered revealed that the patients with unilateral and bilateral inguinal herniorrhaphies sutured with cotton required less narcotics than patients undergoing a similar procedure in which catgut sutures were used. The patients with wounds sutured with cotton required more sedatives.

The presented data support the clinical impression that patients with wounds sutured with cotton material showed less postoperative wound reaction and were more comfortable than patients whose wounds were sutured with catgut.

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K. O. H. E. T. K. b. l. h. A. t. 888 83
4 M. A. D. W. H. d. O. c. i. s. n. e. \ J. Am. M. A. 939
- 5 I. d. m. S. g. y. 94 7485 53
6 S. H. A. M. B. P. S. g. C. y. n. O. b. t. 937 64 765
7 W. H. I. P. A. O. A. S. g. 933 98 662

PARA ARTICULAR CALCIFICATION (PELLEGRINI STIEDA) IN AFFECTIONS OF THE KNEE

I WILLIAM NACHLAS MD L t t C! I MC AUS B l t m M y l d d
JOHN L OLPP MD M J MC AUS E l w d New J v

THE existence of anomalous calcifications medial to the lower end of the femur has been known for a number of years (3, 4). Though this condition was originally considered to be a rarity, recent reports indicate that it is not uncommon. The nature of the mass, its origin, its exact location and the proper manner of treatment have all been subject to many opinions.

Opportunity has been presented to us to study carefully a rather large number of patients with such calcific deposits. Within 6 months, 30 men have been sent to us for examination and treatment for this condition. It has been possible to make careful clinical and roentgenologic studies of these patients. In addition, we were able to obtain 1 specimen at operation and laboratory studies of this specimen have been made. Finally, dissection of the pertinent area in 9 cadaveric specimens and 1 fresh knee at autopsy gave us the opportunity to establish some interesting facts relative to the pathological anatomy.

PATHOLOGIC ANATOMY AND PATHOGENESIS

There has been considerable controversy as to which tissues are involved in the formation of the calcified mass. The tibial collateral ligament, the tendon of the adductor magnus muscle, bursae, the popliteum, and the bone itself have all been considered. A careful study of the roentgenograms has been helpful in locating the calcification.

Roentgenographic examination revealed these calcified masses to be situated in the soft tissues on the medial aspect of the knee directly overlying the adductor tubercle (Fig. 1). In a few instances they seemed to be continuous with the bone proper. In the cases in which we changed the position of the knee slightly and took new roentgenograms, we could demonstrate that a distinct layer existed between the condyle and the calcareous mass (Fig. 2). This translucent layer is thin usually less than millimeter in width. The calcification is difficult to see on a lateral view of the knee joint, indicating that it is not very dense or thick. The level at which it is noted that the adductor tubercle somewhat posteriorly.

to the bony attachment of the tibial collateral ligament distal to the area in which the tendon of the adductor magnus is fixed. The shadow may appear as a short straight line. When it is more than a centimeter in length it appears to have the shape of a curved line and is more or less parallel to the curve of the tubercle. Further length of the line is usually acquired proximally and is formed by a reversal of the curve so that on roentgenographic examination of the right knee it has the shape of a flat letter S. The newly formed curved portion is somewhat further from the cortex of the bone than the original straight part. These facts indicate to us that the tissue in which the lime salts are deposited is not part of the bone but overlaps the tubercle fairly intimately so that it is continuous. When the length is greater than proximal position curves gently to the opposite direction to be parallel to the concavity of the bone contour above the condyle.

A more direct examination of the involved structures was permitted by the findings at operation. The skin incision which ran longitudinally over the adductor tubercle was carried through the subcutaneous fat to the fascial layer. This was then incised to expose a white fibrous membrane that seemed to invest the medial aspect of the condylar epaision of the knee. It covered the tibial collateral ligament, the adductor tubercle, and the attachment of the tendon of the adductor magnus. When incised at the level of the adductor tubercle the undersurface of this layer was found to be adherent to an osseous button like plaque that was apposed to the tubercle and was mobile over it yet was not part of it (Fig. 3). When the bony plaque was removed the tubercle was found to be somewhat less polished in appearance than usually is but was covered by a thin periosteal layer. No connection could be found between the dissected area and the inside of the joint. Indeed, when in the course of the operation on the joint entered it was observed that about 2 centimeters separated the uppermost medial part of the inner joint space from the area occupied by the calcification. It appeared therefore that the capsular layer of the joint and the synovial membrane was adherent to the inner aspect of the femoral



Fg
Fg Roe tg g m f nght k h gth t t l os t l pp g
th dd t t be l
Fg Roe tg g m h g l f d m d lt f dd t t b l ts m
d ta f m th t b l ll t l l g m t d p t d f t by d l t l e

condyle below the level of the adductor tubercle and that over this there ran a layer of tissue which covered the tibial collateral ligament the adductor tubercle and the adductor magnus tendon (Fig 4)

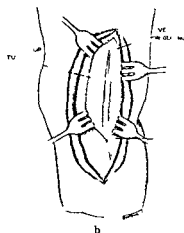
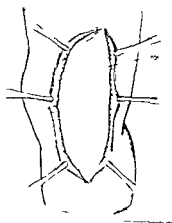
An attempt was made to identify this outer layer in standard textbooks and atlases on anatomy but most of these references are rather brief in their descriptions. Because of this dissections were made on routine cadavers in the anatomic laboratory.¹ It was found that beneath the fascia lata there existed an aponeurotic layer that hugged the medial aspect of the knee rather closely covering the tibial collateral ligament the adductor tubercle and the tendon of the adductor magnus. This membrane was not firmly attached to the underlying tissue and indeed seemed to glide over it. When the knee was fully extended and forcible abduction was attempted the aponeurosis seemed to glide distally over the tubercle. The amount of movement was not great but a pin stuck through the layer and anchored in the periosteum was clearly tilted distally by this maneuver.

other within the membrane coursing longitudinally from the upper part of the incision over the adductor tubercle to disappear in the deeper structures at about the level of the knee joint. The membrane glided easily over the underlying tissues and could easily be dissected off to expose the tibial collateral ligament the tendon of the adductor magnus and the clear polished adductor tubercle covered only by its periosteum.



Dissection of a knee at autopsy immediately post mortem revealed similar structures but indicated more accurately the state of the tissues. When the fascia lata was incised and retracted the membrane that covered the medial skeletal structures of the knee was found to be gliding and white. Three small veins ran parallel to each

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g tru t f bo



F 4 M di l pect f n ht knee L nt d l t p f b l th gh f sc l t
h win tl ghdi m mbra tauri th t urse no d t dyl f f m th gh f sc l t
dd t en t d d tib l ll t l l m t Atia hm t f

The location of the Pelles in St eda calcifica-
tion is thus clarified. It is formed directly under a
membrane that overlies the lower femoral condyle
on its medial aspect. Lateral to it is the peri-
osteum of the adductor tubercle. When the cal-
cific mass elongates it tends in a proximal di-
rection so that it lies between the tendon of the
adductor magnus and the overlying membrane.
The condition is not due to a fracture of bone
from the femur, a tear of the periosteum or a
calcified bursa.

Statistical reports based on our cases are likely
to be misleading since our group of patients does
not constitute a fair sample. Our patients are all
soldiers and are generally young male adults.
Most of them had been examined previously by
radiation while acute trauma is prevalent.
Only a small percentage of the knee cases in these
units are treated by us. Nevertheless it is possible to
make some hypotheses as to the formation of the
lesion by considering the history and the clinical
findings.



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soft tss es les w ll but calcificatio distint.

The calcification has generally been attributed to an injury consisting of a twist of the knee joint. In our patients an attempt was made to determine if the condition was developed with or without an injury. If an injury had been sustained the patient was asked if he had had a direct blow or an indirect trauma such as a twist of the knee joint. The histories were not entirely clear in all cases. Six patients gave histories of sprains or twists of the knee but only a few of them recalled in what direction the leg was forced. Two patients reported direct blows on the joint but of these only one indicated that he was struck on the medial aspect of the knee. Three patients had had twists with apparent recovery but later sustained direct blows in automobile accidents or when falling on their knees on the obstacle course. Two patients denied having had any injury whatsoever. Their knee complaints constituted only a part of a polyarticular arthritis. Two did not recall any injury and in the remainder the records are not clear. It appears therefore though major trauma is found in most of these cases that it was not the indispensable agent in the production of the condition. It is significant that in all of these patients there was evidence of arthritis in the adjacent knee joint. Examinations revealed thickening of the capsule occasionally there was fluid increase and on rare occasions there was limitation of motion. All roentgenograms showed the bony lappings that are considered manifestations of arthritis. Since these changes are not produced immediately after an injury it must be deduced that joint inflammation had been present for some time prior to the precipitating injury. Indeed one was able to obtain from the patients the history that the knee joints had been troublesome for months or even years before the examination that revealed the calcific masses. The pains in the knees were chronic some being attributed to a weak joint while others were considered rheumatic. Since chronic inflammatory involvement of the knee was always coexistent it deserves consideration as an etiologic factor. Though the calcified mass is outside of the joint the hyperemia associated with the inflammation of the joint proper does affect the environs and so supplies an important liaison between the two areas of pathology.

The element of trauma may be supplied by a single severe tear but may also be the result of cumulative wear and tear produced by friction of the membrane as it glides when the joint moves. Since the adductor tubercle projects medially it must form a local factor irritating the fascia that moves over it. Any abduction of the knee joint

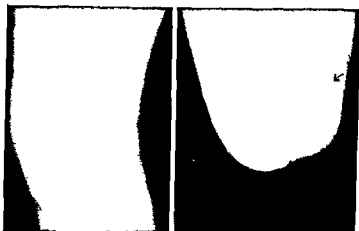


Fig 6 O b d m ss l y g d d t t b e l E
th h p h t g ph ed g nizat f m th
t ualpe ph ry dt becal ted t be gnu d

must produce a strain on the membrane particularly where it stretches over the promontory of the tubercle. The area under consideration is thus vulnerable to degenerative irritations as well as to tearing strains. On the other hand the frequency of ruptures of the supportive structures of the knee on the medial aspect without the subsequent development of the Pellegrini Stieda complication leads one to question any hypothesis that the rupture alone can produce this complication. Furthermore in none of our cases was the injuring force of such magnitude that a major laceration of the medial soft tissues took place. In none of them did the sprain lead to an instability of the knee that would suggest a major lack of support on this side. Even the more severe twists were strains rather than severe sprains. All of these factors make us believe that the series of events leading to the formation of a calcific deposit is as follows. A process of attrition takes place on the inner aspect of the gliding membrane over the critical point namely the adductor tubercle where friction can most easily be obtained. This process may have its origin in a series of small traumas that do not attract much attention. The process of attrition will be speeded by the swelling of the tissues that is induced by either polyarticular (systemic) arthritis or local traumatic arthritis of long standing (Fig 5). As a result of the degenerative process affecting the undersurface of the membrane the tensile strength is reduced so that a relatively moderate injury may cause an incomplete tear. This rupture is associated with a laceration of small blood vessels such as we have seen



b



d

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 f ft tss m d l f m ral dy l b O t be 943 lifica
 ti ee dd t t be l N mbe 943 cal fi d m
 m ll b t m uiz d d d D mbe 943 t post
 d ta ti l w h pl q f m b t t tta hed t t

in our dissection and permits a moderate amount of bleeding to take place. The tendency is not of such magnitude that a large hemorrhage is formed or that the open avenue of escape for the bleeding through fascial planes. The small hemorrhages are trapped locally and molded in its position by the outer coating of the membrane. The encapsulated hematoma thus formed undergoes degenerative changes which under the proper physical and chemical conditions lead to the calcification. The exact nature of the conditions has not been

demonstrated in our cases. It has however been shown elsewhere that blood coagulates within itself the elements that are necessary to produce calcification in areas where the calcium and phosphorus concentration is adequate and where a relative alkalinity exists. The blood cells and plasma are within them and esters of phosphorus as well as the phosphatase that is necessary to convert them into inorganic phosphate. Whatever the theory for local calcification may be the fact remains that calcification of hematomas is a well known occurrence.

rence. An early step is the leposition of lime salts in the form of calcium phosphate granules. The granular nature of the shadow is shown in our roentgenograms. Under some conditions of repair this unformed granular mass can be absorbed. In other instances however there is a gradual organization of this mass that leads to the formation of bone (Fig 6). This phase too is demonstrated in our serial roentgenograms (Fig 7). The specimen we were able to examine represents this stage (Figs 1 and 3).

We find many analogous circumstances in the shoulder where similar lesions occur. These have been intensively studied. The supraspinatus tendon running as it does over the head of the humerus is subjected to a considerable amount of friction as the result of the movement of the arm. In spite of the intervening bursa there is a great deal of attrition going on in patients who use their shoulders excessively. The degenerative changes affect not only the bursa but also the adjacent surface of the tendon. Incomplete tears of the tendon have been demonstrated in many instances. The precipitation of lime salts in these areas is by no means uncommon. At first there is a soft creamy mass which becomes gritty at a late stage and not infrequently becomes organized into definite body of bone. Microscopic examination of the tissues before organization has taken place reveals that there is a low grade inflammatory process in the soft tissues in which the precipitation takes place. We believe that the process of calcification at the knee joint is quite similar to that of the shoulder.

SYMPTOMS AND PHYSICAL FINDINGS

It is rather interesting that when our patients were asked to localize the pain in the knee they pointed to the area just below the patella. None of them indicated the region of the adductor tubercle. Since we did not see them immediately after the injury that led to the calcification on them we were asked if they had had pain near the tubercle. None of them recalled any acute discomfort in this area. Many of them had some discomfort in the knee at the extremes of extension and flexion. Some of them had an ache that was present particularly on weather changes and when they first arose from a sitting position. Other complaints included prolonged walking made the knee hurt. On examination one could feel the thickened capsule and an occasional loose fluid increase. Pressure over the articular edge of the tibia produced pain in every case. Palpation of the adductor tubercle revealed some local illness which felt bony in character. When compared to the corresponding

area on the unaffected knee there was a distinct though not large bony prominence. In none of our cases could we move the calcified mass over the underlying bone. Pressure on this area gave discomfort in about half of the cases but at no time was tenderness great. We believe it possible to recognize clinically the existence of such a calcified mass in a large percentage of the patients if in addition to the usual examination procedures for injured knees we add careful palpation in the region of the adductor tubercle. Of course after the local lesions have become radio-opaque roentgenographic examination will reveal their existence.

TREATMENT

Since the calcified mass is extra articular and is so situated that it does not irritate tissues within the joint proper—the knee joint and the Pellegrini-Stieda calcification must be treated independent of each other. The articulation constitutes a problem that is not germane to this paper and must be treated on its own merits. The calcified mass in our group of cases has not been a significant source of discomfort to the patients. It is conceivable that in the acute stage there may be an appreciable local irritation associated with the newly calcified bone and lavage of the precipitated lime salts may prove as valuable as it does in the shoulder calcification. We have had no experience with this procedure. Physical therapy in the form of local heat may have some value in clearing up the calcification having been given to 2 of our patients in whom the lime salts disappeared. Roentgen therapy likewise suggests itself as a therapeutic measure though we have not applied it in these cases. Surgical intervention is in our opinion rarely necessary. Inasmuch as the symptoms connected with these are relatively insignificant it is conceivable that if the mass is large enough to cause increased irritation on the investing membrane further attrition of this layer at the critical point may take place. In such circumstances removal of the plaque may be indicated. If surgery is contemplated one must recall the injunction made by Kulowski not to add the trauma of surgery to the area before the calcification and organization have been complete. Otherwise one may find a return of calcification in the scar of the operation. In our patients the only one that was subjected to operation had the bony mass removed because an arthrotomy was necessary for the removal of a joint mouse and the Pellegrini-Stieda calcification could be removed at the same time without much trauma. Eleven of our patients were returned to full active military duty. Those who were not were separated from the service for

reasons other than the calcification. Since only 1 of our cases had the calcified mass removed and since all had been given an opportunity to exercise the extremities before they were discharged from the hospital we feel that the Pellegrini Stieda calcification does not entail any appreciable disability.

COMMENT

The imposing name of Pellegrini Stieda disease is misleading. It implies that the one finding of the calcification of the adductor tubercle is a disease complex. The stress that is given this particular manifestation tends to detract from what is usually the significant part of the patient's disease—namely the arthritis of the knee joint. Furthermore because of the visualization of this anomaly there has been a tendency to associate the symptoms of the affected knee with it. This belief has led to surgical intervention for the removal of the mass. In our opinion such an approach to the problem is inaccurate in that it stresses a relatively innocuous manifestation and tends to overlook the major disabling factor.

SUMMARY

1 Ten patients with calcification over the adductor tubercle are reported and the operative findings in 1 case are described.

2 A description is given of anatomic dissections and 1 autopsy exploration of the area under consideration. These studies revealed the existence of a membrane which we consider an important factor in the formation and shaping of the calcified mass.

3 The coexistence of chronic arthritis of the knee is stressed.

4 A hypothesis as to the etiology of the calcification is presented.

5 Attention is directed to its relative clinical insignificance.

6 Conservatism in treatment is stressed.

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THENAR PALSY DUE TO COMPRESSION OF THE MEDIAN NERVE IN THE CARPAL TUNNEL

R B ZACHARY FRCS O f o d E g l d

In 1909 Hunt described a curious syndrome characterized by gradual atrophy of the radial part of one or both thenar eminences the result of paralysis of abductor brevis and opponens pollicis. The short flexor of the thumb is usually spared, there is no fasciculation, the reaction of degeneration is present in the affected muscles and the condition never involves the interossei or hypothenar muscles. Sometimes there is subjective sensory disturbance in the tips of the digits but usually no demonstrable loss of touch or pain sensibility. The patient is usually middle aged or old.

Hunt 1909 1911 described 3 cases and regarded them as occupational palsies due to repeated firm pressure on the branch to the thenar muscles at a particularly vulnerable point where it turns forward over the lower border of the anterior carpal ligament. Wartenburg (1939) challenged this theory because of its incompatibility with Saunders' finding that the median nerve motor branches are nearly always covered by a slip of muscle, either flexor or abductor pollicis brevis.

Marie and Foix (1912) in describing a series of cases of isolated muscular atrophy of the hand mentioned one which tallied exactly with those of Hunt but they ascribed the condition to syphilis since the patient had lightning pains in the leg and the ankle jerks were absent. There were no other signs of central neurological disturbance. Late (1913) they performed a necropsy on a patient suffering from a similar paralysis unfortunately it had not been possible to test sensibility satisfactorily since the patient was over 80 and hemiplegic. They found a neuroma on the median nerve just proximal to the anterior carpal ligament and a constriction of the nerve trunk beneath the ligament. Histological examination of the neuroma revealed a decrease in the number and size of the myelinated fibers and a noticeable increase in the interfascicular connective tissue. At the site of constriction there was gross fibrosis within very small bundles and distal to this complete degeneration of the fibers.

Brouwer 1906 recorded 15 cases and favored a phylogenetic explanation. He suggested that

the thenar muscles, being recently acquired characteristics, are more susceptible to trauma and under adverse conditions more liable to undergo degeneration than other muscles.

Harris 1926 mentioned wasting of abductor brevis and opponens without sensory loss as a complication of arthritis of the trapeziometacarpal joint.

Lhermitte and de Massary 1930 recorded the necropsy on a patient suffering from this syndrome in which there was atrophy of the dorsolateral nuclei in the sixth and seventh cervical segments of the spinal cord.

Dorndorf 1931 described 16 cases all women at or about the menopause—a factor which he considered significant. He suggested that there was a toxic neuritis affecting motor fibers more than sensory.

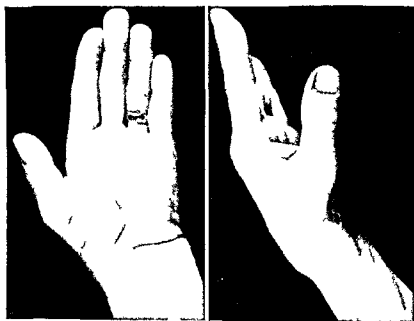
Moersch 1938 who added 1 case supported the view of Hunt that the motor branch is injured as it passes over the distal edge of the anterior carpal ligament.

Wartenburg 1939 presented 7 further examples. He dismissed the possibility of median nerve compression because nearly all the recorded cases affected only the outer part of the thenar eminence and there was seldom any sensory disturbance. His views are similar to those of Brouwer.

Woltman 1941 reported 2 cases of thenar palsy, 1 of which had slight sensory loss in the median area and was associated with acromegaly. The other a woman of 71 with arthritis of the wrist had a complete median nerve lesion with motor and sensory loss. She made a perfect recovery after section of the anterior carpal ligament by Learmonth, an indication that the paralysis was due to compression of the nerve trunk. He suggested that the nerve may become compressed by an increase in intraneural connective tissue as in acromegaly or by narrowing of the carpal tunnel due to periarticular thickening.

The explanations of the thenar palsy offered in these papers can be summarized as follows: (1) pressure on the motor branches of the median nerve at the distal end of the anterior carpal ligament; (2) phylogenetic susceptibility of the thenar muscles; (3) compression of the median nerve in the carpal tunnel; and (4) a spinal lesion.

From the Department of Orthopaedic Surgery (Physical and X-ray Centre) Oxford.



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DISCUSSION

It has been shown that various authors have postulated lesions of the motor branches the muscles or the anterior horn cells but rarely the main trunk of the median nerve to account for the almost purely motor character of the lesion and the inclusion of the short flexor of the thumb.

The spasm of the short flexor is easily explained. In common with many other workers Hunt 908 recognized that the thenar muscles may be partially supplied by the ulnar nerve although Wartenburg did not accept this view. More recently it has been shown by Hallett 943 that in about 3 cases of 4 the flexor pollicis brevis receives part or all of its nerve supply from the ulnar nerve. An examination of many more patients by us has confirmed this finding for in a high proportion of median nerve divisions flexor pollicis brevis is still acting. That this was the state of affairs in the 2 cases described was shown by faradic stimulation of the ulnar nerve and a similar explanation is likely in the previously reported cases. But it is not surprising to find that in some instances e.g. Woltman's case and some of those cited by Dorndorf all the thenar muscles were affected since there is a minority of subjects in whom flexor pollicis brevis is supplied entirely by the median nerve.

The second source of difficulty in diagnosis is the almost complete absence of sensory disturbance. This has led previous authors to incriminate the motor branches of the nerve (Hunt) the muscles themselves (Brouwer and Woltman) or the anterior horn cells (Lhermitte and de Massa). Another explanation is possible. It is known that moderate trauma may affect a nerve selectively so that one function is suppressed with little or no change in others (Stopford 926). Recently Sande and Seddon (unpublished work) have shown that in traumatic injuries the larger fibres—motor and proprioceptive—suffer more than the smaller ones and this dissociated type of lesion is frequently encountered in peripheral nerves on from many cases.

In Case 1 there was a mild sensory disturbance at the fingertip whereas in the other there was no demonstrable sensory disturbance at all yet in both the site of the lesion was undoubtedly the main trunk. Moreover, subject to sensory disturbances were present in one of Hunt's 3 cases

and in 5 of 7 of those reported by Wartenburg in of which there was demonstrable mild impairment of sensibility.

In patients presenting this syndrome there are therefore good grounds for suspecting a lesion of the main trunk of the median nerve and the possibility of compression of the nerve in the carpal tunnel must be borne in mind.

The cause of the compression may be quite obvious as in the case of the malunited Colles fracture and a number of examples of this have been recorded. Most of these lesions followed the injury within 1 or 2 months (Bouilly 1884 Lewis and Miller 1922 Abbott and Saunders 1933) and the sequence of events was then quite clear. In only a few recorded cases did it occur as a late sequel. Abbott and Saunders reported one example occurring many years after the injury and quoted two others.

Fractures of the carpal bones especially the scaphoid are a fruitful source of osteoarthritis of the wrist and if there is much peripheral swelling narrowing of the carpal tunnel is ultimately inevitable.

Several of the cases reported by Brouwer and Dorndorf and one of Woltman's had arthritis of the wrist.

It is possible that other factors may produce the same state of affairs but there is undoubtedly sufficient evidence to demand a careful investigation of the local condition in every case of this syndrome if only to exclude compression of the main nerve trunk in the carpal tunnel.

The early release of the nerve by division of the anterior carpal ligament may lead to recovery of motor power but if the paralysis and wasting have been present for many years it is unlikely that recovery will occur since the changes in the muscles will have become irreversible. The contrast in the cases presented is very striking. In Case 1 the paralysis had been present for 14 years and there was no sign of recovery 3 months after operation. In Case 2 the symptoms had been present for only 15 months and within 2 months of release the nerve abductor pollicis brevis had recovered.

SUMMARY

Two cases of the syndrome of partial thenar atrophy are presented.

The paralysis was due to compression of the main trunk of the median nerve in the carpal tunnel.

3 The partial nature of the atrophy is due to ulnar innervation of flexor pollicis brevis.

4 The almost complete sparing of sensory fibers is probably due to the selective action of the

trauma affecting the large fibers (motor) pre dominantly and producing a dissociated type of lesion

5 Division of the anterior carpal ligament is suggested as a means of relief

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der ed from celomic epithelium is potentially capable under certain conditions to undergo metaplasia and produce mullerian like ducts and tubules. Weller expressed a similar view and stated that the subserous stroma cells of the peritoneum could form masses of decidua about these heterotopic gland structures. Schiller (39 40) stated that in early fetal life the entire peritoneum is potentially able to form endometrium but in the course of normal development only the peritoneal cells in the mullerian region retain this potency which may remain latent for years and then as a result of stimulation may be activated and form regions of endometrium within the peritoneum. Halban Schindler Carere Comes and others concluded that endometrial tissues migrate to the lymphatics draining the uterus during menstruation and are carried to extrauterine locations. Sampson (33 34 35 37) has proposed that a retrograde flow of menstruation products occurs. The cast off viable endometrium he stated is implanted throughout the pelvic peritoneum. According to Sampson endometrium is displaced also through venous and lymphatic channels more frequently by the veins than the lymphatics. Goodall believed that endometrium becomes invasive as a result of faulty ovarian secretion but stated that lymphoid tissue and tissues outside the pelvis are unsuitable for the growth of heterotopic endometrium. H O J ones stated that these heterotopic tissues may come from either the superficial two-thirds of endometrium or the basal layer and that specific physiologic changes occur more readily when the more responsive superficial layers are involved. Possibly some of these heterotopic tissues may be

more immature than others and hence incapable of functional activity and decidual reactions occur in stromal cells of the heterotopic endometrium only after functional maturity has been reached.

Gland like tissues in lymph nodes of the mesentery near the pancreas in the neck and around the salivary glands according to Carere Comes may come from embryonal displacements of tissues. Sternberg said if endothelial proliferations in lymph vessels lead to epithelium like formations it would be difficult to believe that such a transformation should confine itself to the border sinuses of lymph nodes without changes in the endothelium elsewhere. He concluded that epithelial cells from these glands migrated through the lymphatics to regional lymph nodes and formed small glandular inclusions.

CONCLUSIONS

Heterotopic endometrial tissues with decidual reaction of the stroma cells were found in a pelvic lymph node of a woman who died from the hemorrhage caused by a ruptured extrauterine pregnancy.

The decidual reaction of the stromal cells in these heterotopic tissues indicates that these tissues during the term of pregnancy have the physiological changes of endometrium in the uterus.

Of the theories proposed as to the origin of heterotopic endometrium none as yet has been accepted generally. Probably the factors involved apply also to the origin of glandular structures observed in lymph nodes in other regions of the body.

EDITORIAL

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AUGUST 1945

GASTROSTOMY

FROM a survey of the large number of operative techniques developed for the performance of a gastrostomy one might gather that a large field of usefulness existed for this procedure. Undoubtedly the most common lesion for which this operation is performed is a carcinoma of the esophagus especially of the middle third where the majority of these neoplasms are located. Our experience at the Cook County Hospital has given us reason to reconsider the entire problem.

We have reviewed the records of 80 patients on whom gastrostomies were performed between 1941 and 1944. There were 72 males and 6 females—a frequency in females higher than that ordinarily reported. The ages varied between 51 and 81 years. The classical symptoms of dysphagia, inability to retain liquids and solids, and weight loss were uniformly present. Of particular interest was the average weight loss of 36 pounds in this series of patients. This implies the loss of 16,000

grams of tissue—the most important fraction of which is tissue protein. X-ray examination or esophagoscopy or both usually have demonstrated the lesion before operation. The middle third of the esophagus is involved most frequently, the lower third next, and the upper third the least frequently. Almost one half of these patients show a secondary anemia when admitted to the hospital. It is certain that the incidence of anemia would have proved to be higher had blood counts been repeated after dehydration had been combatted. In another series of cases previously reported in which patients required various surgical treatment, an incidence of hypoproteinemia of 23 per cent was found. Hypoproteinemia was considerably more frequent in this group of cases; here again the actual incidence would have been still higher had dehydration been taken into account.

The usual preoperative preparation consisted of the use of antispasmodics, liquid diet where possible, and parenteral fluids and vitamins. Twenty-six of the 80 patients received blood transfusions and in no case was more than 500 cubic centimeters given. The operations were performed by several members of the attending and surgical staff. A variety of anesthetic agents were used; local anesthesia or intercostal block was favored. Average operating time was slightly over one hour. The types of gastrostomies performed included those described by Janeway, Witzel, Spiva, Thorek, and Glassman.

In many instances the gastrostomy was performed with the hope that resection of the esophagus could be accomplished at a later date. Actually, resection was done in only one patient and in this instance it proved to

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August, 1945

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*Supplementary to
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OBSTETRICS

Pregnancy and Its Complications

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Puerperium and Its Complications

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J v sov G Roe tg T tm t d th C se
f C f G t C l l Tum th Osse Sys
tem
T DE s v F I j ry f B es by Roe tg T t
m t f C f th Ut C rvi

Surrg ry f th B s J nt M cl T d n Etc
He MAN N O J Th M M rry Ost t my f
N nt d Hip F t

F tu d D l c t n
B TL F H T v S B HAM A K K
J A d W v H M H T tm t f
C mpo d F t by F ly W d S t
d P nall
A N P D d GRAM A F T sc dyl
F t f th H m ru T ted by Du l p
T act R p t f C es
B B H d Y o R H C mpo d F
t es f th F m T ted th th Aid f
P cll
M C F NE J A C mpo d F t W
944

Orthop d n G ral
H v J L A t A t n P l my l t d
P gn y
3 AN D d H H A E penm tal N
p lyt P l my l t f q y d R g
f P th l g l l m t

SURGERY OF BLOOD AND LYMPH SYSTEMS

B d V l
H K H J W d R f L
Ch m Strid E ly L f D t P rs t t
Right A t A h
N LL J L d SCHMIDT E R Wh l Fl
AN w M thod f E l t u g P ph l
Vascul D se
Fu t x I S N H R L d W v K L I A
t n l Sp m Sec d ry t L gat d R to-
grad I ject f th S ph V
R v H Th mbophl b t f th Lat l
S
AND LL P O Th mbos f th I t m l C t d
Art ry
J R d H H H S g y f D p
V Thr mb f th Low E t m ty
LL m A H d LORP J W J AN
t M thod f Blood Ves l An t mos
Experim tal d Clinical St dy

B d Tran f n
TR ITON F LA LE F A d Li TE U
H m lyt Disease O Dzyg t Tw
IE TELL H H d GUNTRE L St dies f Plas-
m v lum th H m B g C m p t
Res lts f Red t f Pla ma v l m I tra
muscula P es re and v ou Pressur n Sur
gical Shock

D AM D L K d A LS V M Th Dem
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64 d R p d Shd T t
Thy J E VIO A d V LA ME I
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di tu Sod m

SURGICAL TECHNIQUE

W S g ry
S w H G d R LH G L Cranio-
b l W W d Ob rv t D layed
T tm t
Sm Y Th Med l C rp R d A my Op-
t
GRAHAM J D P High Blood P ft B t t
W KE R M d H CH W R S Ab-
d m l l j n t th B H p tal
M FAR J A C mpo d Fra t W
944
43 L LEH T D d W m W F Fl as
S ld rs I l d th S th P f
7 C W M T m C J H rr A M
B f E d Oth P l h A
P gr R po t
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44 Op t S g ry d T h q P t p h
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Ca
D H Roe tg Diagnosis f Ut E do-
m trisi

GRAY C J a d HAMBY W B Roe tge ographi
Dem trati with T tatum Powd f S s
es Res lt g f m the Extr ctuo of f t r v t
b l D P tru
NELS N J d STRAND ERG O R tgen T eat
m t Ca cer of th Larynx
GYLSTORFF PETE S N H The Roe tge T eat
ment f Ca ci m f th Beat
H YL N J On Imp ving th R sults of T at
ment Ca ce f th Collum Uteru
JAN V G Roe tge T tm t dth C rs of
f G t C l l T m r th Os Sy tem
T UELS F I J ry f B es by Roe tg T t
m t f Ca f th Ut C rvis

Miscellaneous

THY ESFV J E VIDE AE A d V LAUM I
Th T tm t f L m th A th l R
d tu Sodium

MISCELLANEOUS

Chnical E tite — Gen al Phy i log cal C d th
B CH G E d WINSOR T Th R l t f
T tal f bl Loss f W ght t W t Lo
f m the Ski d Lungs f l m S bjct
S btrop cal Clum t
W LKE J Jr d SHENKIN H Studies th
Tox m Synd om Afr r B rns Ce tral V rv
s Syst m Ch ges as Ca se f Death
McLA RL C W d HOLL o J L S lt
W t Ulcers f th C tremities Ther O cu
Jap se Surv rs
Do W L d NUP ER P H Chnical Aspect
and T tm t f C ta eo s Ca

G ral B cterial Prot o a d Para t Inf t
ENGLEROR T D d W LMAN W I F l rias s
S ld s I l d the S th f cifi
SMITH F R J F l rias A St dy f 737 P t is
So D gnosed
CRAI W M T MPSON G J HOTTE A M
BAR LE E E and Oth rs P m illi A
P gres R pot
W LOHA M B d C T T C W C A Smpl
Tech q f th F timat f P m illi th
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ABSTRACTS OF CURRENT LITERATURE SURGERY OF THE HEAD AND NECK

HEAD

G 1 nd L H d M ttram M E Traumatic
Pn umocephal R d l gy 1945 44 37

Pn umocephalus occurs most frequently following fractures involving the skull and meninges. On rare occasions it is the result of gas formation of an intracranial tumor which has eroded into the nasal sinuses.

Its mechanism is explained on the basis that with coughing sneezing swallowing and blowing the pressure in the sinuses uses a downward momentary increased force against the site of the fracture entering into the cranial cavity. This may collect the substance of space subdural pac brain vessels.

The usual cause is usually a simple fracture of the posterior ethmoidal and sphenoidal cells often

being accompanied with meningitis whereas the subdural air is more apt to follow fractures through the posterior walls of the frontal sinuses. The air in the bony substance or entricular system depends on the extent of adhesions located on the fracture and amount of external pressure. It is often associated with subdural air.

It is interesting that pneumocephalus as a rule develops after a latent period of several days to several months. Daily called attention to this fact in 1906 when he reported series of 4 traumatic cases. In only 6 of these was there a pneumocephalus before one week; 3 occurred before one month; 1 between four and six weeks and 5 at later dates. The last test being after ten months. The reason for this is not clear but the authors are under the impression that the hemorrhage and edema which immediately follow the trauma prevent the passage of



Fg Roentgenogram made 7/9/43 in which fracture of the frontal bone is visible in the right frontal region.

air into the cranial cavity Lat especially when the patient b m very activ th ba c s f r fo g the air thro gh th as yet non t d fra tu l nes b mec ns der bly g t r The f cto which p ced th crudescence of sympt ms not infre qu tly blowing of the n se n ing r unusual activ ty at t mes a o iated with th flow fa clear fl d f om the nose Wh ther the sympt m a e mld or as m e often th case of an inc ing sev ty system t c r entg nograph c examination f th kull w l establ h the diag o s w th ut d ffi culty

The mo tality rat is u d 40 per c nt death usu lly bei g du t menin t Surg cal int rve t n with cl su e of the dural wound s indicat d n th prog ve cas

The authors rep rt on f their own cases n whi h pn um cephal f flow d h t g in th ght tem p ral g n in s c d l t t mpt Th h otng ccurred n Sept mb r o 1943 The first e tgen m at on made on Oct ber 6 943 rev l d mul tipl m tall f agm nt scatter d l g the p th f the bull t in th f tallob area nd there w the xpect d tellat f actures t the po nt f entry d t f th b llet but no intracran l r c uld b d m nst t d On N vemb 6 943 the pat t dev lped ft r blowing of the nos tw sev but f h d he iated with vomit g a d e t g n e e m ation f th kull ow h ed l am u t of r m b th l t l vent cles nd om th thrd nd fou thve t l s as f v ntricu lography h d be n perfo med Th re w also larg c llet n of r n th subd l sp f th ght f tal ea n ar th eg on f th fract th ough the t r o f ss Th p t nt w pl d b d nd h c v d completely A th d ro nt g n m at nt n days l t show d only a t ce fa mai ng th lat l vent cle d n ar t all w s oberved in the s bdu l pac

T L UCHT M D

Th ma K H F ctu and Fra tu D locati n f th M ndibul C ndyl AM thod f Open R d ct n nd Int n l Wiring nd On f Sk l t l Fix ti n with a R port f 32 Cases J O I S g 945 3 3

This t cl g s hsto cal vew f th t eat m t of ndylar f t a d cl ficat of f ctu s w th d pl cem ts d f t re d sloca t n

Th diff r nt m th ds f t tm nt a dis c ed m ly nt m xillary m m ob liz t n by l gat f nt lt tm t d mbinat n f fixat n nd f nt n l t eatme t R po ts n th r lt f thes m th ds en m r t d

Th results well th w t s own p ce b n t th f t that th es lt btand by the p tes con rv t v t tm t not s good susgen lly bel d O th trary b th majo fun to l d t b and m n r compl cat n uch a p in and l unted m t w th m l ccl n e qu te commo complaints l t It w s

p inted ut that i chldre spo ta eous readjust ment of th mand bular j nt ep physeal gro th of th dyl d p s t g f th teeth will m tum g tly d th c r r cto of m r defects that a c p s nt after t tm t b t th t i adults better results can b bta d by operative pro ced res

A method of op n d t w th fixat on by int n l wiring was advocat d f ca es which there w s w d separation of th f gme s w h ch d posed to no r m k d d a d d place m nt of th co dyle which w ld lt sh rite g f th ramu and a op n b t

There i n a alysis of 3 ca s f condyl fra tures treat d t the Massach tts Gene l H p tal B t du g the past eghtee mo ths h ch sh w d the foll w g cond t s

Numbe f fractures

C dyla

S bco dyla

Right co dyl

Left co dyl

N d i pla m t f dyl

Displa m t lat lly

Displacem t medially

F ct dislocati n, m dually

S blurat

C mpl t disl catu

C mpl t di lodem t

D locati f p r t f dyl

Fract di l catu f ra d

Fra t di locatio w th displa ed m nscu

Old f act with pseud thr

W th n kyl

Numb f p tu ts

M l

F m l

Fra t es

Unilat ral

Bi t al

N th mandibula f t

O ther m dib la f t

Tw th m dibul f ctures

Commun ted m dib la f t

T eatd by int rmaxillary fixat

W th pe ed tu w th t local fixat

W th int rnal n g fix tu

W th k l tal fix t

W th int rnal wiri d k l tal fix tu

Co dyl ct my

Osteo rthotomy

A d ta l d d pt of th m thod f t rnal w g fixat f r h ca c l d d tog th t w th 4 ca r p r t

EYE

D wning A H Ocula Def ct in 60 000 Selectees A h Ophth Ch 945 33 37

D wning g d cuss s the cula d f cts n 60 000 el ct es who w e m ed fo i duct on i to the r m d f c s He po ts th t f o me pre e ted some cul dfect.

The i cid nc of c lar def cts was a f l l w s

	T tal no.	Ra 10
R fract e Err rs		
Myops bel w / oo to 20/400	55	4
My p below /400	36	66
My p (h gh) nul ter l	48	5
Hypermet p bel w / oo to /400	7	845
Hypermetropia bel w /400	6	3
	3	3
Strabismus		
Esot p th ambly pua	77	78
Esot pua th t mbly p	8	706
E t pua th mbly p	96	
Ex tr pua w th t mbly p	93	646
Right hypertrop		
	45	48

Paralysis of the extraocular muscles was found in 24 cases (a ratio of 1:2,500) ocular nystagmus in 8 cases (a ratio of 1:750) external oblique muscle in 94 cases (a ratio of 1:203) abnormalities of the iris in 47 cases (a ratio of 1:46) and of the lens in 257 cases (a ratio of 1:233). There were 173 cataracts and 6 cases of aphakia. The widespread disease of the optic nerve in 53 cases (a ratio of 1:32) 45 of which presented atrophy of this nerve. Disease of the retina and choroid was found in 374 cases, a total of 160 cases of general edema of the retina and choroid in 6 cases abnormalities of the central region in 97 cases, retinal detachment and closely allied conditions in 38 cases and typical myopic choroidoretinitis in 9 cases. Monocular loss of vision due to amblyopia was observed in 2932 cases (visual acuity below $\frac{4}{4}$) it was due to trauma in 836 cases and it was idiopathic 96. Of the 2932 cases of monocular blindness or with partial loss of visual acuity 49 per cent of the females, 94 per cent of the males have been proved to be congenital. The remaining cases of monocular blindness were posttraumatic cases of monocular blindness. Amblyopia was found in 920 cases, 855 cases without strabismus, 770 cases with congenital strabismus and 95 cases with divergent strabismus.

JOHN A. ZUCKERMAN, M.D.

Sn II A C J P r f rating Oc l Injuries Im J
Ophth 945 S 63

In n aly s f 72 c s s f perf t g cular
n j es which co ld be f ll d ove p od of
t me the author f d the foll w fact rs and
compl cati s to be f mporta ce th g f th
pat nt the agent cau g th j y th l gtha d
cat of th lacerati th nat d d g of
pr lapse th d gr e f dam g to th l th d
gree f ntra cul r h m rth g ce ccu nec f
le to th p es ce or bs ce f t ed tra
ocula for ign bod s a d the occur f sym
path t c phthmia
F ct rs l d g to u f v ble p ognos s in
l de inj res by bl t bjects d bl perfo at
f the globe eve d g s fpr lps sever tra
ocular h morrhage and a tra cul infect on

The incidence of sympathetic ophthalmia among these cases was 1.45 per cent.

Suggested surgical intervention included repair by means of conjunctival flaps or real sutures or both.

HUTTE H. ROMAINÉ M.D.

HC TE H ROMAINE M D

Band M B and Full w L T Visual Disturbance Produced by Bilateral Lesions of the Occipital Lobes with Central Scotomas *Arch Neurol Psychiat Chic.* 1943 53 65

The case of a patient who sustained bilateral gunshot wounds involving the occipital lobes of the brain in a fairly symmetrical fashion is reported. This patient was completely blind for a time and subsequently regained in a gradual fashion a certain amount of peripheral vision. He had bilateral central scotomas which remained permanently. Careful observations of the patient's recovery of vision were made with reference to perception of light movement form and color as well as other subjective visual phenomena and orientation of the field of vision.

The first visual function to return (two days after surgery) was that of light perception and with this was associated dislike for bright light and it was later observed that the patient could see better in a dark room than with adequate illumination. Because of the loss of central vision the patient was day blind. In this condition the peripheral portion of the retina responds better to low illumination than to bright light.

Perception of movement followed very soon and this is one of the better functions of the peripheral portion of the retina.

Perception of form is based on v s lacuity e pe
nient and i terp t i o n c o n s q t l y w i t h o t
ce t r l v s i o t h i s p a t i e n t h a d v r y l t t l e p e c e p t i o n
of stationary obj cts H i w a s a b l e t o i n t e r p r e t t
o m e e t e n t m o v i g o b j c t s i n t h e p e r i p h e r a l f i e l d
p a r t i c u l a r l y f m l o b j e c t s a n d e p i n c e a d
m e m o v w r e d i s t i n c t a d

cept o color was slow but after five mo ths he was abl to cog ize rd gen and blue neon s gns—appar ntly th result f an island of color vision in the rght homonym s s peior a da t

The patient tried to avoid bright lights or avoided looking directly at bright objects to do so produced a sensation of heat waves before his eyes with an increasing haziness which interfered with his vision.

The patient was not aware of the central scotoma despite repeated testing and discussion with him concerning the loss of central vision. He continued to insist that he was able to see objects directly before him and he stated that everything before him appeared normal; visually satisfactory. This is a normal mechanism of psychological filling in of visual field defects and objects are thus perceived as a whole.

Seven months after injury the patient was able to appreciate the size and shape of objects with a patient

f the esid lild f is n a n w cente of d
t nctn ss a n w f t n l fo e a w f r m d d
h o l g p j e c t d h u b j c t m d p i t
t the b l d macula r a a t h s t m h e c l d b
co r c e d t h a s g h i p h l r a s
a s l t f g i z a t i n o f h p s y c h o l g c a l f i e l d
n d t h e l i q i h i g o f h o l d p t t e n f

HOWARD A. BOWEN MD

All nd F P Diffu N ur fibromat (n
R c k l n g h u n s d s a) In l v n g t h B u l
b a C o n j u n t i v a R p o t f a C a w i t h L e i n
f t h S k l t a l S y s t e m a n d S k i n B o d i l y A s y m
m t r y a n d I n t r a c r a n i a l I n v l m n t A h
O p h t h C h i 945 33

All nd p o t s a c a s o f d i f f n u o f i b o m t s i s
(v o n R c k l n g h s n s d i s s) h c h i n v o l v e d t h e
b u l b a r c o n j u n c t i v a a n d w a s a s o c i a t e d w t h l e s o s
o f t h e s k e l e t a l s y s t e m a n d f t h e s k n a n d w i t h
a s y m m t r y f t h b o d y a s w e l l a s i n t r a a n l
i n v o l v e m n t

There are the clinical form f n o f i b o m t
() t h s e i n w h i c h t h e p e d o m i n t v o l v m e n t
i s u t t e d i n t h e c e n t r a l n r v o u s y s t m o i n t h
i n t r a c l o s () t h s e i n w h i c h t h t r m l
t r u c t u r e s s t h k i n a a f f e c t e d a n d (3) t h o s
n w h i c h l e s i o n s o f t h e s k e l t a l s y s t e m p r e d o m i n a t e

T h c a e e p o t e d r l d t h f l l w g u n s u f
f e t u e s t w n s h p c o e t n i n e r f i b r m t o s i s
a n d e p i l p y s y m m e t r y o f t h b o d y t r a c n i l
d r d e r s s l i g h t m n t a l r t d t n s k e l e t a l l e s o n s
u t a n e u l s o (c a f e a u l t p m n t a t) a n d
p t l a l p e c i a o f t h s c a l p o n t h e m d e a s t h
a f f e c t d y e

H i s t o l c a l e m n a t n o f t h m v e d t
c n i m d t h d o f n e h b m a t s (n
R c k l n h u) J O S H U Z K E R M A N M D

R y c e f t B W P n H l i n n d t h e C o n t l o f D p
I n t u l I n f e c t i n B t J O p h t h 945 9
57

The t h r d s s p l l n d t h c o n t l f
d p t c u l n f c t w h i c h r l t f o m p
t a t g w u d c a s d b y m n m a c h u g u n b u l
l t s m t a r s g r d d h l l i e

H e c m m d t h f l l o w i n g m t h d f t h
c n t r l f t h s e n f e c t n a n w t m

T h w e a r n f t h P r s p x A t m n v
(m d e o f a c f t u t m t l) b y p p n d
u l t t r o p w h o l k l y t e t r S h
m i n e

C l e o f t h e y w d a t f r v d f i l d
t a t o s b y g r a l g n

3 T h p r e c f p h t h l m g e f
f r w a r d n t h l d a s p b l t h t t h n t r v l
b t w j r v d t m e n t d d t h t t r
o c u l a f g n b d e e t r a c t d a d t h t p
t r a t i n g w a n d a l e d

4 I n f l a t n f p d i l l n p o w n t l l w d
f t h e y t n r l y t a g f t h i n f t n

5 S p e d y v a c u a t i o f t h p a t n t s b y t
b e h p t a l

6 T h e u s f s u l f m u d e s a d f o r o n p r o t a
7 S a m h s e c t f o t h e s w h i c h r e p r e
t h s p e d e

T h a u t h o r p o t o u t t h a t p e n c i l l d o e s t
e n t t h m e d a f t h y e w h i t s d m t r e d
b y i t r a m u s c l j u n t i o n a d t h e f e t h e r e
f d e e p i f e t n f t h e y e s o t f e c t d T h e
t o l e r a t e s a n d t s l g e c t t i o s f p e n c i l
l n i n j e c t d t t h e m e d a b t d p n f e c t o f f
e y e a n o t c o n t o l l e d t h e r b y P n c i l l n s u s d i f
p v t n r a t h r t h n c u I t h l d b e u s d a
l c a l a p p l c a t i o n s s n a s p b l f i j u r y

J O S H U Z K E R M A N M D

EAR

D n d y W E M n s D i a I n D e f M t
A h S g 945 5 74

A c o t l l y d f m u t w t h s h a l o s
n b o t h d v l o p d r c r r g t t a k s f o r t r y
t i o n n d o m t t h a g l t w t
t w o y r s A t t a k s w r p d d b y n o e s a l
a c c m p d b y f i l l t h g h t
V e s t b u l f t w n t c d d t t a l s t
f t h e r h t h t h n w d e A m a l i r m u
f t h e b o o f t h p y m d a d f t h t e r m l a c o
t e m t u l n w t h a b o r m l y m l l c t u c
n e r v e s s o d t p a t

F l l o w g p t n a c o m p l t l o f h n
w a s d m t r a t d i n t h e h t e a r d t t c k f
v e t o w e b s e t u l t h t m e o f w n t g

N o p s r p o t n M e r d s a c a s e
f o g t a l d f m t m h a s b f u d D f s
f t h t y p e h f r m l y b n h t b e s t l
w t h m l f r m t f t h l b y t h a d f t h
o g f c t T h e b d f m e r d m
h a c a p s t s l d c
J R L D S Y M D

R n w H C t i d B o d y T m f t h M i d
d l E a d M t i d A h O t l C h 945
4 64

A b r r a t t m s o f t h c a o t d b d y e v r y r a
O h t m h h o c d n t h m d d l
d m t d b t w a s n o t d m o t r a b l t h n k
h e e p t d f t h f i s t t m e

T h p t n w t h t y y r o l d h t m
w h h d b e n d a f f t y r s b t h a l s p
p t o t t m d R a d c a l m s t d t m y s
p e r f r m d a d t h t m r m w m d R
c e r y w a s v e t f l J F D M D

NOSE AND SINUSES

K u l l y B M T h U n d A b f n I v s o c m
t r i t M d t i n J A m M A 945 1
37

A a l i t f t h d f l s o
t r i t r m d e t i s d c a t d
T h p r i m y a s s t r i t f f c t o f s y m p a
t h m m t c d r u g l l y f l l w d b y e c f o
s o d i a t t

duce n enla ged thy r d gland in the f t s It i
 suggest d that th ilb pl d by i dine ome
 eks b f e d l i ery Fo p tie ts p evious ly
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 t l d s has u lly be n 600 mgm d ily with the
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 to 400 mgm It wo ld eem th t the to ic effects f
 th drug ar d t rd sag

B NJ MIN GOLDMAN M D

B pchne M rt n n K nd Uhrbrand H R
 xam nation f P t nts with E phth lmi
 G t Treated Con rv t ly t d m d
 nd 944 7 5 3

With th p iod f m 93 t 94 9 pat ents
 w r tre ted fo phth lm g t n th K m
 m H sp tal Cope h ge Eighty f r w
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 It r thei d i ch g f m th st t t o Th
 m g 75 p t ent r am ed the m
 me f 943

All f th pat ts e t t d th sed t ves d
 b d co fi m t a d some ec i d d d s lso

Th ty t f th pati t tat d that they we
 bl t o k lth gh ly 8 of thes w ent ly
 ympt m f e the th rs prese t d ympt ms which
 wer m rle po d Fi p t ts we e
 part lly d abl d d 5 w tot lly d bled 7
 h d u de g p at et atm t n th terv n
 i g pe d b cau of pers t n t ympt ms and 6
 b d d d f o me phthalm c g t r

Data n the basal m t bol c rate at th tm of the
 r e minaton at the t m f operation n th
 t rve ng pe d w labl n th cases f 5
 f the 69 pat ts who rv d The was a v
 q est o abl n ase i them tab lic at (r r
 per c t) i 3 p t e ts R t s f e 4 per c t
 w r f d m 9

A mp s n of thes res lts ith those of per
 t v t tment ho s dsp tably the d nt ag
 f gical t e tment

Med cal tre tm t was best f r th g p of pa
 t e ts i wh m th ll ess had b n pres t f less
 th n o y ar a d wh s basal m tab lic rat
 ma d bl 4 p r c t

Upo e am at of 5 p tie ts who had
 r d y t atm t the uthors obs rv d
 d fi t d f r b tw the the p t results
 bt d ths gr p a d the es lts btan d u
 p t ts wh had r c d p cly med cal tre tm t

Th th rs mphas e the f ct that w th m d cal
 the py th e is a much lo g p d of all ess a d
 d bil ty than w th g c l t at me t a d th t
 thi p l gat of the ll s f r the creases th
 pos ibl ty f the de el pm t f compl c t n e
 pec lly th he t

Th th rs g w th Me a d R ch d
 th t pr ly m d c l t tme t f e phthalm c
 goite n ess t tes th p dit of m y m th
 on complet d c t cure whe a ympt
 tomat recov ry is p s bl n a f w w ks a d th
 h gh degr e f saf ty by me f bt tal th
 d tomy in a i d m s 10

J PR K NARA M D

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Ibáñez J S Study f th My n ural Syn psia E
perimentally nd in Blopsl s fl man Mus
cles in Cases f Paralysis (Est d d la psa
mi ral xp nm talm ty b p s dem s
cul h m p raltu) C g ap l co
m for 944 93

In studies of ant i polio myelit m ce were in
oculat d with the Sk tra n of polio my lities virus
adapt d to mice by Jung blut In ome cases it a
f u d that there wer no lesions of the se tor of the
med lla correspond g t the paraly d muscles
There were marked ch ges in the mot pl q es f
the p lyzed muscles The hist l gical findi gs are
illust ated They showed dist tegrat on of th motor
arbo rizations of the plaques There w r n cha ges
i the sensory t minals

I the study of th egenerati n of the fibers
gu pigs were ued a they d not uncumb to the
d s ase R g erat n f the fibers wa f u d

These studies sh that p raly s f ce t l
orig n due to destruct on f the n c cell of the
ant i r co d of th med lla s i ep rable but
paraly is of pe iph l or g n due t chang s in the
erv a borizations f th motor pl ques s repar
able It was al f d that th e e f rms of th
d sease with both f ve a d par ly s f ms w th
few but without p rly s nd forms with ther
f r par ly s s that i f ms in wh h th d s ase
is ot apparent but the i d l aff t d act as
car rers Th s plains the appea ce f th d eas
in s l t d cases th t ha e ppar ntly n t be in
contact with the viru This is of great mpo ta ce
i th study of the d ease

In mning the the organs of th b dy th y
w e fo nd to sh w typ cal ch ng s whch l ad th
uth t b liev that th d seas i a v rem a that
s that the v us invades the blood and s carr d t
th d ffer f o g s

Nerves f om cases of h ma paraly s we e l o
tud ed and illustrat o of th hi tol g cal f dings
ar g en S m l r ch ges were found n th rve
a b r izati s whch the author believ xpla s
the r c ery of fu ct n in the cases in which th
d as shows a favo able c urs

A EY G M AN MD

BRAIN AND ITS COVERINGS CRANIAL NERVES

Den y Bro n D Di bility A l l g f m Cl ed
H d l j ry J Am M o 945 7 4 9

A study s m de f o o cas of c l n head
i jury da a aly s f om v r i u ta dp ts is
given

Two hundred cases w e s l cited t of 43 con
secutive adm ss ons xclud g pat ts und r fite

years of age and over fifty five as well as vagrants
and chronic alcoholic add cts The major ty were
derived from traffic accidents nd relatively few
we e severe consisti g chiefly of clo ed head in
jury with varyi deg es of scalp wounds a d
vary g lengths of unconsciousness

An analysis of the symptoms d ring conval scence
revealed that 55 per cent had some symptomatic gy
Th symptoms included h adache and dizziness as
well as psych atric symptoms The d sability last d
from two to n ne mo ths (o mo e) f llow g injury
Th ty patients were p evented f m returni g to
their occupatio s because of i j r s ther than th
head j ry Of the r ma n ng 170 pat nts 136 had
retu ed to full cc pat ion with two m nths—only
5 being away f m work f r lo ger than ne month
Psych at c sympt ms appe red t have th h ghest
corr lat n ith p olonged d ability

P olonged d ability app ared t h ve some rel
t o hip to lo g per ds of d sor ntati n abnormal
neur lo g cal gns blood in the spinal fl d and elec
troencephalograph c abn malit es n add t on to
occupat onal w ies such as an i ty over compe
sat or l g at on

The sympt ms as ociated with pr lo ged d sabil
ity wh th the i j ry was mld o seve c re
p ed m ntly m t l sympt ms r l ted to nx ety
H W A B own MD

Schw tz H G and Roull ac G E Cranioce
bral Wa W und Ob ry ti n on Delay d
Tre time t f S g 945 9

Th portu b s d n 13 ca f fracture f the
sk ll of hich 74 were battle cas lites and th
r m n der we e ccide t l i n j es The number f
open h ad v ds was small but they ill strated
the p oblems th t must be fac d The are 21 case
hist s whch s rve to support the conclusi s f
th a thors Th r port com from the North
African th r f operatio s

The early treatm nt cons ted of complete débr de
m t a d clous i l yers without drai age and
w th ut the local e f sulfonamid s but complet
pa of the dura by f scial aut genous t ansplants
w mad if t was necessary T nspla ts for the
d were obta ned usually from th tempo al fasc
b t om times fr m the fasc l ta Compl te
deb deme t a d clous without drai age may b
sati factory ven after long del y In 8 cases
d b id me t was do after fr m thirty s hours to
f day w th clos e without drai g a d p i
mary h al ng re ulted No arb t ary t me limit f
d fi t e t eatment could be set a d furthermor
t w n t n ces ry As all m d cal sc ence ch
cas must b j dged on its m r t Apparently nt
i wa b tter to delay débrndem nt t a pl ce where
the was competent personnel and d quate eq p
m nt than to g ve ncomplete treatment i the ab

se ce f these f lites The necessity for stand d
qupm nt su h as sucti n sil er clips a d th
electrocautery is emphasized

Cases we p esented in whi h d q t debrid
ment h d b n carried out t v rying periods f
time These h d to b subjected to rad cal d bride
m nt and t was p ss ble in ma y instances t d
this w th t ght l s and with out drain S ral
illust at ve cases d rib d in whi h this w s don
at tim intervals varying f om i ht to thirty two
days following the first inadequate treatme t a d
p rtial debrid ment f the w und T ht d l s e s
not th treatm nt f hoc m ll cases f that a
matt f surgical judgm nt but t can b com
ph led in me cases

The sulfon m des were n t used l cally as a rul
even in late cas but l ed ses f sulfa drugs w
g ven by m uth nd p t lly t h ck the bl od
concentrat on

F cial tra plants we c u d to cl dural de
fects b tin some f the late cas s th y w n t c
essful because of p and c sequ t slo hi
D difficult with f sc l tra pl nts ar p rtu l ly
lk ly t d v l p wh n th inadequate debrid
ment Th p chin f op n head w u ds w th l
f nam d as l n gau ew d d u s m t bl

W th gard to f m b d m tall c s m t r l
was n t o de d s c nstant o ffect
a d when n t access bl t was l f t n pl b t th
d n t apply t th fo en b d s l d b
fra m ts nd pecs of clothin and of h r we
p rt cul ly l bl t p oduc fect o less r
m ved mplet ly

The t m nt f cerebral h rn as was c nserve
at a d sist d f c m pl t d b id m t w sh
g with boric solut and dres with as lun
ga lumb punt e o l f the m th d

Th uth rs rt le should b f int est t ll
tho who lk ly t h v t deal with njures f
thi type I th th ate of perat t pp red
that train d personn la d d quat qupm nt we
mo important th n cally perat esp lly f
th t t n m d f r imp rect d bride m t of th
w nd Th d l t eatme t v ry ealy d cal
d bride ment with all th fa ltu f fully train d
pers n el d c m pl t euro gical qupm t

ADRIEN V UGHEEN M D

R w both m G F nd Ogilei A G Ch nic
Intra rebral H m t ma B t M J 94
46

The clinical p ctur fa p ntaneo bara hn d
h m rrh g s u lly a ily ecogni d by d d
ve h ad ch with with t l s of co sc s
nes n a young m d d l d p v u ly h lthy
nd vid l Th d agn is th n v r i d by th
p ese ce of blood in th l mb b p l f d
S ch hemorrhha es oc a a result of co g nital a
euryms d et a w lness th in th mesoderm l
vascular layer at the sit f jun tion of tw ves ls
r from a stump r mn nt f primitive vess l whi h
has not compl tely disappea ed

Alth u h most f these an uryms rupture mto
the s b rachnoid spac som become adherent to
th bral corte a d h nce may rupture intracra
b lly If the pat nt survi es the cute episol
chr nic ntra b al h m toma d el p T
quite s m la ca p s nted as e mples of th
latt g up B th p t nts had a complete h
ple-mia whi h d v lop d t the o set a d failed to
mp p mod of few weeks th y contin d
to ompl n of h dache and de el ped a econdary
n ntracra l l pressure as evide c d by p pl-
lede ma

Desp te evide ce su gestive of recurrent bleeding
p ated lumbar punctures f lled to reveal a fresh
sub r hn d hem rrh ge On the basis that this
wa n int a bral lesi n r i s t from th m l f
reb l r ry ts bra ches th t n r r g n
of th yl n fi r was plo d by a myopl tic
c t my

In both ca a cystic h m toma was fo d-on
th p temp r l g a d the other in th
le f o tal r F ll wing r m al of th
hemat m n t em ly p d reco ry f m th
h m ple-m ed a d b th pat t ha returned
t a rm l life

Th th rsc l d that th h m pl a w s d
t p u p th m d dle bral rtery rathe
th pon th rt p thw ys n th co ry
w s rapd Th is nt ra lpre ur s
pl ned by n c siz f the h m t m h
l t d f man n l f f d d t th eased
m t t s o f l w th breakd wn f th blood
l t It was bl ed th t the d gers f t mpt g
t expo and l gat r ysm the d pth f th
lv e n w t gre t t w r rants h a p r
d how v r th cc fev cu t n th c t
s u d bl O the th hand th authors d bt
th t u ry ha m ch t fi n the t t ment f
o din ry popl xy n fact in th e ly ta es of
c b l hem rrh d to y ca s

J c k L Woo M D

Sweet L K. Dum ff St nley E D w l g H F
nd Lepper M H Th Treatm t f P mo-
cocci M aingiti with Penicillin J Am M A
945 7 63

P mo cci m ntus s pp e tly ryes t
t t ll f rm f te time t l dings l f m d
th rapy Ffty caes f th d a d ussed
m this rt l som f whch we een d treat d
privat p tce thers w e dm t t d th
Gall Munc pl H p t l Washi gt D C
betw n July 94 and A ou t 944 Upt De
cemb r 1943 4 p t nts w tre t d w th r
sulfadiazin r sulf m raz with the add t n
typ pefic nt pn m coccal rum in 2 cases
Sin D cemb r 5 943 p cillin b cam a lable
ds ce then 6 p t ts hav b t f d l f th
first gr p f p t ts wh m pe cilli w t
us d th w 37 d this wh as in th gro p f
6 p t ts tr ted with pe cill d th r forms of
th rapy th we 9 deaths T bles how t

ligament and logetient a series could not be confirmed. On the other hand in about 50 per cent of the ulnar nerves, the distance was an inch as in the number of the applying the distal portions. This was the case however in the case of the median nerve.

The first nerve runs generally short from the upper extremity. The only particularly notable supply of the median nerve is the deep branch of the brachial plexus which gives off a branch to the nerve. The nerve then divides into two branches, one of which is the ulnar nerve and the other is the radial nerve. The ulnar nerve is the main supply of the hand and the radial nerve is the main supply of the arm.

The brachial plexus of the arm is a complex of nerves which supply the arm. It is formed by the union of the cervical and thoracic plexuses. The brachial plexus is the main supply of the arm and the ulnar nerve is the main supply of the hand.

The ulnar nerve is the main supply of the hand and the radial nerve is the main supply of the arm. The ulnar nerve is the main supply of the hand and the radial nerve is the main supply of the arm.

The radial nerve is the main supply of the arm and the ulnar nerve is the main supply of the hand. The radial nerve is the main supply of the arm and the ulnar nerve is the main supply of the hand.

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The ulnar nerve is the main supply of the hand and the radial nerve is the main supply of the arm. The ulnar nerve is the main supply of the hand and the radial nerve is the main supply of the arm.

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The radial nerve is the main supply of the arm and the ulnar nerve is the main supply of the hand. The radial nerve is the main supply of the arm and the ulnar nerve is the main supply of the hand.

HENRY A. SHEEN, M.D.

Pappen J. L. The History of the Intervertebral Disc. An Analysis of 400 Verified Cases. N. Eng. J. Med. 1945, 3.

The present study is a study of 400 verified cases of herniated intervertebral discs which were seen over a period of ten years in the Department of Neurological Surgery of the Lohay Clinic, Boston. The study is a study of the comparative value of the various methods of treatment of these cases. The study is a study of the comparative value of the various methods of treatment of these cases.

sign. The author believes that this sign would appear in 100 per cent of the cases with intervertebral discs at the third, fourth and fifth lumbar segments provided they were examined in the acute phase of the condition. In difficult cases oxygen spinograms were made. Oddly characteristic findings of a herniated disc were not noted in the roentgenogram.

It pointed out that conservative treatment should be attempted especially in the cases in which there has not been prolonged disability or prolonged pain, whereas in cases in which the pain has caused serious disability and economic loss, operation should be undertaken. With regard to the questions of whether the disc should be removed and whether a fusion should be added it is believed that if there is a long history of predominant back pain associated with abnormal facets and an unstable back, the patient should begin the benefit of a fusion. This is advisable particularly if the occupation of the patient consists of heavy manual labor. The thoracic fusion is so that totally the herniated loose part of the disc should be removed by total discectomy.

The relief of sciatica was satisfactory in most of the cases, but in almost half there was residual back discomfort or heavy lifting or heaviness. This situation was not materially improved in the patients (9 per cent of the series) who also had loss of power in the patients did not obtain any relief of the pain.

Attention is called to the possibility of mistaking the fracture of the cauda equina and to the fact that 6 patients in this series had developed complete paraplegia as the result of mass extrusion of disc tissue.

ADRIEN VERBRUGGHE, M.D.

Key J. A. The Conservative and Operative Treatment of the Intervertebral Discs in the Low Back Series 1945 7 9

This interesting article by an orthopedic surgeon presents an exhaustive study of the cause and treatment of patients with low back pain. It is based

upon a series of 100 consecutive cases which were operated upon for ruptured intervertebral discs in the lumbar region as well as many other cases which were treated by conservative means. The history and physical examination were the prime factors considered in determining the type of treatment to be given the individual patient. It is emphasized that conservative management is attempted first, and only in patients having a history of prolonged disability and relief from conservative treatment should operation be considered. Routinely roentgenograms of the lumbosacral region were taken as confirmatory evidence of a disc lesion, and it was noted that frequently even though a narrowed space was shown on the roentgenogram, the disc lesion was not necessarily at this space, but might be in a space which appeared normal in the roentgenogram. Spinalograms were not taken. As a rule, at least two disc spaces were explored.

For the purpose of treatment, patients were classified as ambulatory patients, bed patients, and operative patients. The group of ambulatory patients were treated with supports with or without sacroiliac pads, especially supported beds were advised, and in some cases manipulations were employed. Bed patients were treated by placing them with the head and knees flexed and the application of local heat, and when the acute symptoms had subsided, the ambulatory treatment was continued. With regard to operative treatment, this was suggested only when conservative methods had failed. The protruded part of the disc, as removed, without curettement of the nucleus pulposus, and with or without spinal fusion. The operative technique is very carefully described. This is the treatment by spinal fusion which is done according to the operative technique described by Breck and by Basom and Bosworth. Also, it is pointed out that the surgical treatment does not give a 100 per cent perfect result, but this remark is true in other surgical conditions. The results in this series of cases are highly satisfactory.

ADRIEN VERBRUGGHE, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

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f th B a t t Centrallas t t in Bo s
Sw d n Act adiol Stockh 943 4 478

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AUDRE G MO A. M.D.

TRACHEA LUNGS AND PLEURA

Ma H G. nd Klopstock R. Lobect my f r
Pulm nary Tube cul l J Thorax S g 945

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4 E ten cas at o f l b w th littl
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th racoplasty Anothe pati nt has tuberculous
empy ma and ill qu r a tho coplasty ter The
fatality occurred as a result of contralateral
spr ad in a pati nt with la ge amo t of sputum

Among the 151 patients, 6 are negative by culture methods and 6 by concentric methods. The latter belong to the 151 patients to obtain negative cultures. The general condition of the patients is good and some are working.

The authors have not attempted to draw any
f al c nclusions r ga d g the resecti of lung
t s for p lmo ary t berculosis and th y have
p res ted thei results mer ly in the hop f clarify
g m y of the probl ms e co te d

F R R T D D RIL M D

J n s R M T t l nd Pa tial Pn um n t my
in the Treatm nt of Pulm n ry Tuber ulosis
J Th S g 945 4 3

The author reports his experience with resection of the lung for pulmonary tuberculosis. Since October 1941 17 partial pneumonectomies and 15 total pneumonectomies have been done. This report is up to May 1944. The cases are broken down into groups of upper and middle lobe 1, bottom lobe 1, lobectomy and total pneumonectomies.

Upper nd middl lob l becto s In this group
the we e 7 upper nd middle lobe lobectomies
The urg cal end cat on in 6 of the 7 upper lobe le
o s was a persist t cavity in spite f selective
p um th ra The other upper lobe les was a
fib cas us o \ th cavity at the ap The
middl lb resectio w s done for b ho t sis
In th gr p there w s death wh h o red
about t cty-o m ths later at a b q e t
l er l b ct my f ste oss d br n hi ta O
th m n g 7 pat uns all a cl cally ll a d
t t m f cept that the r subj t d t middle
lob lobctomy h s positive sputum f m l at
f th br chial st mp

Low l b lob t I this group th re 2
cases f tub rculous bro chi ctasis f h h as
cl d l the g p of uppe lobe l bect m s
S f th other cas p se ted th pers t nt
ca ty or positive sp tum f om a ll p d l r
l be The l st cas p s ted a tub l lo
l be th ut c ty a l gat esp t m

It as cons de d that th pati t in th last case
o l d b s f r w th ect on F l l ng thle g
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lu g O case prese ted tube cul b onch ctas

of the lower middle lobe another a cavity in the middle lobe with extensive disease in the lower a upper lobes The roentgenogram revealed a tubercular mass near the hilum with collapse and bronchiectasis distal to it In this group only 1 patient died in the immediate postoperative period Death was due to a questionable embolus in the remaining lung One death occurred about two years after the operation because of extension of the disease in the other lung Another death occurred about five months postoperatively because of contralateral disease One other patient is in poor condition and expected to die Two of the surviving patients have positive sputum in which it is due apparently to ulceration of the bronchial stump and in the other to bronchial disease in the other lung One other patient is in good condition but has a persistent empyema another has nontuberculous bronchiectasis on the other side but is free of tuberculosis There are in this group of 5 pneumonectomies 7 patients have had an excellent result and several are doing part time work

In this whole group of resections the individual technical aspects were used in all but one case this was an early case done with the tunicate Emphysema developed but the patient survived

FORRE T D DO RI M D

McC rtney J S Po t p r ti Pulmon ry Em
b l l m S g y 945 7 9

Primary embolism is always a complication of systemic disease which is almost always confined to the pericardium. When the embolism takes place the symptoms usually come on suddenly. Death occurs quickly in accordance with the size of the embolus or emboli after some minutes or hours or days. Not infrequently the patient recovers completely. In brief the symptoms are dyspnea, substernal pain, and sometimes cyanosis and anxiety.

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 ely l whe Small no f tal mbol not inf
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 nd du l ho ha sho n e f the d nary
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 the l c f mo al ve altho gh th v y beg n
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 l It rarely h pp that an emb lus has its orig n
 a v n th n id fop rat o

I patients have pathologic hemorrhage with the normal limit of clotting of the blood goes far beyond the normal limit and clots form he there has been no obvious injury to vessel. Many factors apparently perate to use thrombosis. Usually the factors are divided into 3 groups (1) slow growth of the blood stream (2) injury to the vessel and (3) changes in the composition of the blood.

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Th M F Th o T J M D

HEART AND PERICARDIUM

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W und Acta med nd 943 4 496

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A RE G Mo v M D

ESOPHAGUS AND MEDIASTINUM

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S 8 945 7

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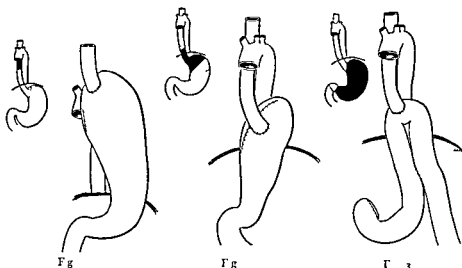


Fig 1

Fig 2

Fig 3

Fig 1 Diagram of the thoracic cavity showing the stomach and esophagus. The diagram is labeled with various anatomical structures and surgical approaches. The text is written in a stylized, cursive font.

Fig 2 Diagram of the thoracic cavity showing the stomach and esophagus. The diagram is labeled with various anatomical structures and surgical approaches. The text is written in a stylized, cursive font.

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5 Av da ce f t y ngl g masses f t s
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m d h h would pr d pose to the d l p me t
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1 L v i t b l f t w th t p just abo b t t
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that such persons who may have suffered recent illness are likely to consult their physician before undertaking air travel.

It is the opinion of the authors that this report of a case of spontaneous pneumothorax in which the precipitating factor was the change of atmospheric pressure produced by the ascent to 8,000 feet in a airplane may influence the advice given to patients in this respect.

In considering the mechanism of this accident, it is probably easier to consider first the precipitating factor which is known rather than the predisposing factor which is questionable. Under normal conditions the pleural cavity is merely a potential space between the parietal and pulmonary pleura in which an average pressure of about 756 mm. of mercury is maintained. In this case the pressure was rather abruptly dropped to about 56 mm. of mercury or by about 6 percent which caused the lung to col-

lapse partially. As long as the pleural cavity remains potential this would not have been possible but with the development of the tendency of the pulmonary pleura to separate from the parietal pleura weakness in the pleura was exploited and pneumothorax occurred.

As for as the predisposing factors are concerned evidence seems to point to adhesions or emphysematous blebs rather than to tuberculous infection in a large percentage of cases.

It has lately been reported that patients with traumatic pneumothorax may be traumatized by air at low altitudes without jeopardy.

Although no definite conclusion may be drawn from this particular case it is the considered opinion of the authors that extreme caution should be exercised in advising patients who have had known diseases of the pleura about airplane travel.

J. N. E. KIRKPATRICK, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

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B JAMRY GOLD M.D

GASTROINTESTINAL TRACT

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On the basis of the works referred to and the author's investigations the limit for the normal maximum rise was fixed at 0.210 per cent and the duration of the hyperglycemia at one hundred and twenty minutes. The exception cases at one hundred and fifty minutes.

The group of patients with nonoperated gastric duodenal ulcer likewise comprised 50 individuals. Of these eighteen to twenty years of age, the greatest majority being under fifty years. Altogether 52 of the 50 tolerated the tests well.

In the tests the fasting blood sugar was respectively 0.117 per cent while in the remaining 50 it lay between 0.074 and 0.110 per cent. Thus the average coincides with the value found in the normal subjects.

The great majority of patients showed a normal blood sugar curve whether the examination was made during a period of peace or not. In 6 patients with pathological curves other causative factors were detected in addition to the ulcer which was the foregoing diabetes. The cause of the diabetes was in 5 other patients with pathological curves the possibility of the contributory factors were not concluded with certainty.

In 8 of the 50 patients the blood sugar the hypoglycemic phase fell to 0.05 per cent. In 5 of these 8 had symptoms of hypoglycemia during the test. One of these was purposely selected for examination because he spoke of having had symptoms that might suggest attacks of alimentary hypoglycemia. In the remaining 49 cases the amnesia contained in this that seemed to point to the direction. These patients were examined to be certain of the fact that the symptoms of hypoglycemia were not the result of the blood sugar falling to a point which would cause a sharp fall in the blood sugar the hypoglycemic phase.

The group of gastric resection cases comprised 38 individuals aged from twenty to seventy-three years. In fifteen cases the highest diabetes mellitus was present in the blood sugar. In 4 a typical diabetes mellitus was present. The patient noted the fall of the blood sugar.

In 7 of these remaining 37 individuals pathological hyperglycemia was observed in all three 32 of 70 tests. In 2 of the 37 cases 2 mm glucose tolerance tests were carried out at intervals of 2 to 3 years. One of these patients examined in the hospital in 1932 for a long time because of hyperglycemia. The test was as follows: 0.50 per cent excreted after the test. The blood sugar was 0.10 per cent. The pathological blood sugar curve of the stomach was persistent. The test was made on the following day. When several tests have been made in the same individual the hyperglycemia is most often found to be either normal or pathological or slightly normal but the reason is not stated.

Other examinations were made in the blood glucose. The same individual at different times. This applies both to persons

with normal and to those with pathological hyperglycemia but the variations are regularly found to be greatest in the latter group. On the other hand we may also find several curves of practically identical form in the same individual.

In several cases the blood sugar after the ingestion of glucose rises up to 300 per cent more. The maximum value is reached at different times mostly after 30 to 45 minutes but generally later than in the normal subject. Meanwhile the absolute rise per minute is greater in the gastric resection cases because the maximum value lies higher. In spite of this high rise the duration of the hyperglycemia is small when complicating factors are present.

A great fall of blood sugar in the hypoglycemic phase occurs more frequently after gastroenterotomy than among normal individuals. In 4 patients with ulcer. The frequency in the latter groups has been mentioned. Of 37 persons with gastroenterotomy 7—or nearly half of the number examined—showed a fall to 0.05 per cent or much lower (7 of 70 tests). Likewise this aspect of the individual does not always react in the same manner during different tests.

From what has been stated before it is seen that the blood sugar curve shows two main characteristics namely a great rapid primary rise and a subsequent rapid fall to low values. The curve is therefore of the type which MacLean designates the lag type. On the other hand it must also be emphasized that one often finds a normal curve.

Glycosuria was noted in 19 of 37 individuals in one or more tests. Two of the subjects were sent for examination on suspicion of diabetes because the physician had detected sugar in the urine. A third was as already mentioned in the hospital in 1933 for observation and the diagnosis glycosuria.

Eleven of 37 persons presented symptoms of hypoglycemia during the more tests (in 5 together). In none of these cases a resumption was observed when the blood sugar value was over 0.03 per cent.

The group of cases of resected stomach comprised 95 persons. The greatest attention was paid to the group of 8 resected men and 4 women. In this group 13 glucose tolerance tests were made. The results vary in frequency about the eighth day after the operation.

The fast night blood sugar in normal individuals is found to be between 0.074 and 0.110 per cent. The highest value (0.15 per cent) being found only in 1 case.

The maximum value varied between 0.119 and 0.294 per cent. The pathological hyperglycemia was observed in 21 of the 95 cases in altogether 26 tests. The degree of the cases which are complicating factors may with more or less probability be presumed to be the pretest of the examination of the 21 individuals (316 tests) in which the pathological rise must be ascribed to the operation on the stomach. In normal subjects maximum value above 0.180

the effect on the blood sugar said that the influence of these predispositions all together presents factors which may occasionally give rise to a hypoglycemic attack.

Different opinions have been expressed as to where the effect for the case of the pathological blood sugar curve after stomach operation is. The general rapid rise is assumed by most authors to be due to a rapid emptying of the stomach. The disagreement concerns especially the question as to why abnormally low values in the hypoglycemic phase in these cases are found more often than is usual. It is logical to seek for the cause in the stomach the functions of which are known to have been altered by the operation. The first of these is the presence of tonicity on the stomach has been directed solely to the stomach. The author believes that the secretory changes may be left out of account. Interest has therefore been devoted principally to the motility of the stomach.

After gastrostomy and resection a change in the mechanism of gastric emptying is taken place. On x-ray examination the signs rally found to manifest itself by too rapid emptying. A number of works are quoted which it is shown that the rate of findings in this respect do not always correspond to the manner in which a dilated stomach discharges its contents from the stomach.

In order to elucidate the possible relation between the emptying time and the glucose tolerance curve, a tonal aspiration of the stomach was carried out in several tests. At each determination of blood sugar some centimeters of the stomach contents were aspirated for a qualitative analysis for sugar. It is pointed out that this method will not always furnish a correct insight into the mechanism of emptying for it must be assumed that many subjects with gastric resection or ectomized stomach the emptying will proceed too rapidly immediately after ingestion of the glucose. As the pressure in the stomach decreases the passage will take place more slowly and the emptying time to prevent a danger of reaction even in these cases. This assumption agrees with the method of the regular calculation observed. The reflex cannot expect to find constant concentration between the course of the blood sugar curve and the emptying time.

A patient was undertaken in a healthy condition the tolerance tests. The stomach was found to be empty one hundred and thirty-five minutes after ingestion of glucose at the first test. In many cases sugar was present in the blood and the time to find it in the blood was eighty minutes after the beginning of the experiment. No definite relation between the course of the blood sugar curve and the gastric emptying could be ascertained.

A patient with a perforated ulcer of the stomach with a peptic ulcer. The stomach was found empty one hundred and fifteen minutes after the beginning of the test. The earliest but otherwise different times. Thus about one third of the subjects suggested was found in the stomach contents that

the conclusion of the experiment. In 2 of the latter rays the emptying time was 100 minutes. In the case of pyloric stenosis however the stomach contents found to be empty one hundred and thirty-five minutes after the ingestion of glucose.

Like use in the ulcer patients no certain relationship between the emptying time and the blood sugar curve could be found. When the gastric emptying is retarded because of pyloric stenosis the hyperglycemia must occasionally be expected to last longer than is normal. In none of the tests in which the emptying proceeded slowly was there a great fall of the blood sugar in the hypoglycemic phase. On the other hand in cases in which the blood sugar fell to 0.6 a drop of 0.05 percent respectively the stomach was found to be empty in the time when the lowest value was reached. This can be taken as indication that a rapid passage of the stomach contents tends to bring about a greater fall of the blood sugar in the hypoglycemic phase.

In cases of gastric resection the rate of passage varied but it was in general more rapid than usual. Aspiration was undertaken in 43 tests and in 26 of these the stomach was empty in one hundred and twenty minutes or less after ingestion of the glucose. The results of aspiration and x-ray examination did not always agree. Neither were the results of spiration in the same individual always found to be concordant in the different tests.

In 4 of 26 tests which showed rapid emptying (with one hundred and twenty minutes or less) the blood sugar reached pathological values. The same was seen in only 4 of 15 tests with slow passage. Two of these tests moreover were made on the same patient in whose case a complacence factor (pelagra) was present which may have accounted for the pathological result. In the remainder of the 4 tests the hyperglycemia was only slightly pathological. In these investigations it would seem to be proved by experience that a rapid emptying often but not always leads to pathological hyperglycemia after ingestion of glucose. This is disproved by the previous fact that have been found as other factors besides the rate of emptying have influence upon the blood sugar rate.

Special note was taken of a case which was better suited than any of the others to illustrate the influence of gastric emptying on the glucose tolerance curve. In this subject a gastrostomy performed twenty years earlier was put out of function by the operation. The emptying of the stomach could no longer take place; a normal man entered upon the pylorus. X-ray examination before the operation showed rapid passage through the anastomosis. This finding agreed with the results of spiration where by the stomach was (3 percent) found to be empty seventy-five minutes and hundred and twenty minutes respectively after the ingestion of glucose. In these 3 tests maximum values of about 0.300 percent were found but in spite of these high values the duration of the hyperglycemia was normal. After the operation 6 times

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of the present investigation it is assumed that only a limited part of the total surface participates in the absorption of nutrients. In case of rapid emptying large quantities of glucose pass at once into the intestine and the patient is disturbed over a wider surface which is thereby brought into function.

A rapid emptying of the stomach proposed by persons with a gastric ostomy or resected stomach more frequently shows a great fall of blood sugar in the hypoglycemic phase than the normal. It is known that the absorption of glucose takes place very rapidly. When the gastric emptying is rapid the absorption will be completed more quickly than normal. Meanwhile the mechanism which regulates the blood sugar after absorption acts somewhat tardily and this applies also to the factors which bring about the reactive fall. When the gastro-intestinal activity becomes emptier than is normal no sugar is present which can compensate for the fall in blood sugar.

N. tvig P. Rönck O. and Svaa Seljesæter O.
Result of Medical Treatment of Gastric and Duodenal Ulcer. *Acta med sc d* 943 3 444

During the six and one half year period from January 1935 to June 30 1941 patients with gastric or duodenal ulcer constituted 10 per cent of all admissions to the Drammen Hospital in Norway. The great importance of treatment in this condition is therefore evident but so far there has not been general agreement as to whether the preferred treatment is medical or surgical. With a view to a solution of this question the authors studied 382 patients (15 with gastric ulcer 23 with duodenal ulcer). Tables and graphs showing the results of the study are given.

At the hospital if perforation is not surgically indicated the patient is put to bed and kept on a milk diet for five days which is sometimes prolonged for two weeks more. The amount is small at first and is increased gradually. Regular examination to decide before and after treatment. On discharge from the hospital the patients are advised to keep quiet for two weeks and to observe a careful diet for a period of one year. They are requested to return at the department for clinical and roentgen re-examination.

It was found that the shorter the history of the disease the greater the prospects for cure. The treatment in cases where the patients had had the disease for less than five years fully one half the number of patients with gastric ulcer about 40 per cent of those with duodenal ulcer became symptom-free. If the disease had persisted for five years more only about one fifth were freed of symptoms. Roentgen examination showed that twice as many of the patients with large gastric ulcers of those with small ulcers could not tolerate treatment. The degree of dependency of the blood had no significance in prognosis.

The authors conclude that it is very important for patients to come for treatment as soon as possible. If they have had the disease for the first time and for less than five years diet treatment should be given. In cases of recurrence operation may be indicated but these patients often refuse operation until another trial of dietetic treatment has been made. If the patient is free of symptoms after a moderate change in diet operation will generally not be necessary but other factors influencing the decision are the nature of the patient's work and his economic condition.

If the patient does not come for treatment until late operation should be recommended particularly in cases of small gastric ulcers and duodenal ulcers and especially if the patient has not remained free of symptoms after dietetic treatment. For large gastric ulcers in which dietetic treatment gives the best results and the patient risks great reoperation soon to be recommended readily although the possibility of cancer in cases with large gastric ulcers must be remembered.

Operation is to be recommended more readily in duodenal ulcer because of the greater risk of renewed hemorrhage and the greater possibility of perforation. Also the majority of cases of duodenal ulcer are in men and as they work outside the home it is harder for them to regulate their diet but duodenal ulcer usually occurs at a younger age when the operative risk is not so great.

An ideal treatment is impossible although the etiology of the disease is unknown.

AUDRY G. MO. AND M. D.

Sanguily J. and Blau F. L. Gastric Schwannoma. *Surgery* 945 7 328

Non-pituitary benign tumors of the stomach are very rare but neurogenic tumors are even rarer. The type of tumor described by the authors is known in the medical literature by many names because of the different microscopic aspects which it may present and the different descriptive opinions explaining its nature. Those on dering it connective tissue or ganglioneuroma fibroblastoma others associate it with the rhabdomyosarcoma and designate it as an inborn type of desmoplastic Schwann cells; called schwannoma and leiomyoma. A. S. M. authors who consider Schwann cells as neurogenic cells (peripheral neuroglia) term these tumors peripheric glioma.

The authors report a case of large benign tumor of the neurogenic type (schwannoma) a fifty-eight year-old negro woman. For many years she had had a discomfort in the left hypochondrium which tended to epigastric and felt like a ball. These symptoms were associated with heartburn and a constant feeling of distention. Her appetite was good and there was no pain. The pigastrium showed good position when it was in the right side but it became very uncomfortable when she had eaten. She rarely vomited but had lost much weight.

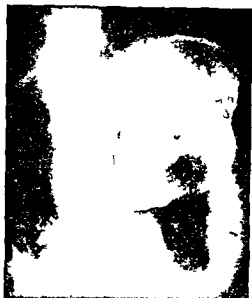


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tu b g recurr s f their d s ase The inflamma tory react n m y r ppea the tum fa t n may recur and by ts l escent into the lo e p lvis pro duce angul tion a d pain r the patient may suffer f m chronic obstipa o

It is agreed that th m jor m nif st tions of di vert culosis occur in the sigmoid re ardless f the e t nt f the preceding d verticulos s This locali tion is appa ently d to the smaller bowel cal ber the presence of firmer fecal masses wh ch ar more lik ly to produce fecaliths in the pock t and the tend ncy of the bolus t be retained for long per is above the rectos gm d canal For th s ason e turpat n of i l ed segments i th s area gives p om e f pe ma e t rel e f om serious compl ca tions

We k w th t bleeding f om the b w l may be p odue d by both d verticulitis and ca cinoma and that d rt culosis may coexist with mal gna t tu mors The absolute d fferentiation betwe n the two conditi is not alw s possible

A method of ma gme t which impo s a waiting p riod f from n e to twel e mo ths foll w g the construct on of a c lost my for d erticul t s b fo e e ectio is dec d d upon places an unw ranted b den upon the p tient and leaves the qu tion of a po sible additio al les n unsolved

With all of th inf mation afford d by procto sc p ce aminat roe tgenograms nd lab ratory findings p evous to cel otomy the s geon sh uld be c mpet nt to dete mi with the added be fit of m im m e plorat on of the tumor whethe o not resect s i d cated If resection is to be do for d ve ticul t s the co dit on of each pat nt follow ing the col stomy sh uld determi the l gth of the i terval bef e the les on is remo d

JOS PH K N RA M D

Rees V L R gl n I J Junitis R po t f n Un u l Case Am J S g 945 67 9

N nspecific inflammatory co d tions f th tes t alt act are not ra but it is nus l to see these co d tions in the pper gast o test l t act with ut a s milar path l g cal co d t on in the terminal ile m Likewise the s f l mmat ryc d t o s s l dom cause complet i testinal obstruct n No nspecific inf lmmatio s f the gast t tinal t a t occur most f eq e tly i the reg on f th termi al il um This dise s d t butes itself e th gion ally or diffus ly th o ghout the g str nt un l tract When the d ffu e type is e c entered th majo p thological ch nges a e us lly l cated nea th distal ileum It is u su l to s the p m l jeju um in of ed witho t e de ce f a s m l r p r c ess m r dist lly

Th author describes n unus l cas of n sp cific reg nal jeju it s a which the p o m l j j num w s completely obst act d t th ce s l t ed places Abot s feet of j j num w esc t d a d n end to s d ast mosis w s p rformed Th pati t s reco ery was u e t f l d she is ell d symp tom free one year lat r

Th gh this les n is obstructive in nature it sel d m causes as complete an intestinal obstruction as as illustrated by this case Even in the more se

cases a narrow chan el can usually be demon strated i the r entg nogram (stri g s gn) The gen eral d nutritional edema present in th s case un doubtedly contribut d to the c mpleteness of the obstruct On exam nat on of the g s s patholog cal pecimen there w e found at l st thre areas of constr ct o ith isolated clo ed segments of sm ll b wel that were greatly diste d d w th fluid and g s These isolated distended loops d d not collapse u t l the constricting ees were incised The seg m t l distribut n of the ulcerated consticting a e s with u involved i testine i terven i g s cha acte st c of the segm ntal type of th s disease and illust tes the so-call d sk p areas

Usually the jejunal variety of this d ease is not ame able to surgery as the process extends ov such a long segment that resection or s de track ng p rations sho ten the gastr ntestinal tract too m ch Because of th c mpleteness of the obstruct ion in th s case it w s imperative that someth ng be done In view of the two isolated obstructed loops f small bowel resecti n seemed to be the only ra t nal form of therapy

In cases in wh ch the inflammatory process is l mited to the te minal ileum excl s on procedu es re often done but ult mate resect on is usually i dicated In op rating upon patie ts with th s con diti n one must rem mbe to d vide the bowel w ll above the i volved port on in o der to avoid recur re c s When a res ct n is p e formed the mesen tery n ed not be res ct ed deeply as the disease does n t sp ead vi the lymphatics as was once thought Th fact that a ye has pass d s nc op ration and th are o sig s of r currence m kes the prognos s in th s case q t hopeful When recurrence s appear th y us ally m nifest thems lves withi a y and p ctically always appear b fore two years

CH RLES BARON M D

Spellberg M A and Gray L W Region I En t ritis of th P xim l Jej num foll wing Trauma S gery 945 7 343

The case of g nal ent ritis reported he e is f i t est ot o ly because of co fi m nt of the p th log cal pr cess to the most p oximal port on f th jej num but al o because the preceding trauma may ha had a etol gical relat o ship to the l sio A twenty three ye old soldier was hospital ed f i j ries stain d when his motorcycle ran nto th rea end f a truck II sprinc pal c mplaint was eve e g neralized abdom l pa n which appa ntly was not cr mple ke He al o usta ed injur es t the f c with fra tu e of the fa al bones a d a f act re of the fifth rib Exam at on r vealed n v s bl sign f abd minal wall co tus on a d o e i de f f e e a i th pert cal cavity Th abd minal pa n subs d d within n e days D ing this pe iod he vomit d o ly a few times a d c tued t hav bow l moveme ts nd t pass fl tus

Seven weeks later he experienced the first recurrence of abdominal symptoms. These were relieved for the most part by a saline cathartic and enema but residual abdominal tenderness persisted. Then during a thirty-day interval he became much worse with vomiting after nearly every meal and abdominal pain.

Physical findings were indefinite but usualization of the gastric test in contact with barium hydrochloride latent on the stomach and duodenum and almost complete arrest of the peristaltic movement of the ligament of Treitz. Distal to this point for about 12 inches the jejunum showed stenosis and absence of peristaltic waves and marked tenderness. About three months after a jejunal exploratory laparotomy revealed a lesion in this area resembling that of subacute nonspecific regional enteritis. A short circuiting operation was done to put the involved portion of the bowel at rest and mesenteric lymph node was removed for biopsy. After a good postoperative convalescence the patient's food intake became limited because of postprandial epistaxis. Five months after the first operation the gastroenterostomy was taken down and the first incisions of the jejunum were resected with end-to-end anastomosis of the esophageal segments. There was no evidence of skip areas. The pathological diagnosis was chronic regional enteritis.

The possible etiologic relationship of trauma to regional enteritis is discussed.

JOHN L. LEVINE, M.D.

Elmer R. and Red J. A. Nutritional Requirements of All but 3 Feet of Jejunum and Half of the Colon. *J. M. A.* 1945 4: 45.

A thirty-year-old man had many previous operations for regional ileitis beginning in 1932 during the course of which two sections of the ileum were resected. He had been asymptomatic for more than a year. Secondary malnutrition was admitted to the hospital he began to suffer abdominal pain and difficulty in moving his bowels. There were at other times he suffered from severe diarrhea. He then developed mesenteric right iliac quadrants which finally came to a head and drained fecal material and pus. Shortly afterward he had gas and calm palpitations, gurgling in the ethra, which condition persisted. There was a loss of 50 pounds in weight.

Abdominal examination revealed moderate distention and a fecal fistula just above the right inguinal ligament. Cystoscopy demonstrated a small contracted bladder with cystitis and no distention at the point undoubtedly that the abscess on the right iliac quadrants. It is not fitted with a proctored led a connection with the urinary bladder and with no loops of small intestine and the existence of a gastric type of the upper part of the pelvis behind the bladder.

At the first operation 3 feet of terminal jejunum were observed to be missing from the ileum.

The rest and all of the small intestine and the small length of normal jejunum as demonstrated by the roentgenogram. The colon as normal with hepatic flexure distally. Because no other procedure was possible the jejunum was divided at the point where it became diseased its central divided and an isoperistaltic side-to-side anastomosis made between the jejunum and the ileum thereby restoring continuity.

It was deemed inadvisable to excise the cecum and ileocecal junction at the time because of the presence of the large external abscess in the pelvis. The effect of the operation was to minimize the point of infection. Several loops of the small intestine which had been opened during the operation were placed together. The roentgenogram from the postoperative interval indicated undisturbed intestinal chemistry with both the sulfa drugs and penicillin and by complete parenteral alimentation with amino acid glucose electrolyte and vitamins and the nutritional status of the whole blood.

Nine days later the stable steatorrhea was removed the peritoneum was entered and the anastomosis located. The interval between the ileocecal junction and the ileocecal junction was 3 feet. The colon was divided at the right of the anastomosis the distal end resected and a total colectomy of the remainder of the small intestine completed. This procedure of the division of the superior mesenteric artery. As the dissection approached the pelvis a large pelvic abscess encountered the contents of which were evacuated. When leakage to the peritoneal cavity in the bladder was observed the mass of the distal intestine was removed in pieces. The abdominal wall closed with the gauze and the gauze less than the sutures. In addition to blood transfusions intravenous feeding of the chemical therapy as continued. Severe food as started by mouth and the patient made an unventilated recovery. The hospital stay ended ten days later the patient was discharged. The wound healed completely except for a small infection which as drained in the eighth day. The patient was discharged.

Apprehension was felt that the person had only had 3 feet of small intestine and that the large bowel would have great difficulty in absorbing food. However, the patient on the improved diet by the time a period of three months he gained 40 pounds. The month later he was 14 pounds. The malabsorption fact that on an restricted diet the patient pleases the food times daily. The patient seems old but is a day.

STEWART, ZIMMERMAN, M.D.

Excluding the distal part of the Cecum and the distal part of the Managments. *A. S. G.* 1945 8: 1.

This is a case report of a thirty-year-old male patient with a diagnosis of appendicitis.

was operated on through a McBurney incision. On delivery of the cecum the appendix appeared normal but the lumen was distal to the side of the cecum appeared to contain a large tumor which was incised to take a biopsy. During the biopsy the incisions were carried down to a black gangrenous mass which proved to be a solitary gangrenous diverticulum. Removal of the gangrenous diverticulum and surrounding tumefaction would have made it mechanically impossible to close the cecum. The area as therefore sutured by itself in the peritoneum to the granulomatous wall of the cecum around the base of the diverticulum. The cecostomy has been clinically gradually.

JOHN G. CRMD

R C B n g n Surgical L s on of the Right
Col n J m M A 945 7 568

Although only one fifth of clinical cancers are found in the right colon, the ileocecal junction is the location of the majority of those inflammatory polyps and tumors of the abdomen which require surgical treatment. Tuberculoma, simple ileitis, and nonspecific granuloma of the colon must be considered in the differential diagnosis of sigmoid conditions of the large intestine.

Hypertrophic tuberculous of the intestine restricted chiefly to the cecum was first described by HENR. HARTMAN of Paris in 1891. It is frequently primarily local. The tissue changes are characterized by cellular infiltration and extensive fibrosis with consequent thickening of the wall and constriction of the lumen. The symptoms are local tenderness, a pain on occasion of bleeding, flatulence and distention. If the disease involves a limited area of the large bowel complete section is indicated.

A sample ulcer of the cecum was first described by C. Veilher in 1867. The great majority of cases which have been reported describe the ulcer as being situated in the mesocolic part of the cecum near the valve. The cause is unknown; the diagnosis must not be stanch based on the absence of celiotomy or autopsy and every patient not operated on has died. While less than 5% of cases have been reported in the literature it is probable that numerous unreported or unrecognized instances of this disease have occurred. The condition is encountered both rarely and frequently and may first present itself in an acute form and progress rapidly to perforation is common. In the stages of the symptoms resemble those of appendicitis with pain, nausea, tenderness and local temperature. The usual preoperative diagnosis would therefore be appendicitis.

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suggestion that regional ente itis is a better name
for the les Its syndrome is characterized by pa n

the right lower quadrant of the abdomen diarrhoea fecal colic abdominal obstruction and the formation of fistulous tracts to nearby viscera of the abdominal wall Young men are commonly afflicted In the acute form the bowel is edematous swollen adherent to the omentum and adjacent peritoneum and is associated with soft enlarged mesenteric lymph nodes When the chronic phase is reached the patient has lost appetite and weight he has a chronic complete obstruction and not infrequently a palpable mass which consists of gray soggy edematous adherent terminal ileum and cecum The treatment is surgical and consists of radical removal of the portion of the bowel involved

Object has been raised the differential diagnosis from this granulomatous process involving a demagatig disease of the bowel and a rarer group of massive localized nonspecific neoplasms which occur in the colon and in other portions of the bowel. However, Cohen believes that although the etiological agent may well be the same, the gross appearance, anatomical location and dissimilar method of growth a distinction warrants separate consideration. Localized neoplastic polyps of this type while of unknown origin, display a microscopic picture somewhat resembling regional enteritis do not cause diarrheal stricture and fistulous tracts they tend to increase in size while remaining at one area of the bowel. It is difficult to suggest a clearcut diagnosis of differentiation between cancer and these inflammatory conditions because of such common factors as tumefaction similar to nontoxic aphasic appearance and chronicity. All of the latter however, are usually associated with some temperature elevation and with an increased leucocyte count. A more pronounced and the more usually more severe. It is perhaps quite fortunate that surgical intervention is indicated in each of these conditions because if a patient has received the extended adequate preparation necessary, considered essential in surgery of the large bowel before the abdominal is not removed any discrepancy in the operative diagnosis can be safely corrected. The proper procedure is instituted at the time of surgery.

CHARLES BAR N M D

Pugh H L nd Ne l od J P Multipl P l
ypold Di e f th Col n nd R ctum A
S f 945 88

Adenomatous or multiple polypoid diseases of the colon is a heritable condition. Malignant supervention is inevitable at an early age; practically 100 per cent of such cases.

The first of these tatem nts constitutes a disti ct
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JO EPH GASTER MD

Kaufman L R S pl S and M sig H J
P forati n f the R cto l gmo d S g y 945
7 337

The e cas of tr umat c perforati n of th r cto
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JOHN L. LINDQUI MD

LIVER GALL BLADDER PANCREAS AND SPLEEN

B pchn M t n h I n Content f th
S rum n Le i n f th Li nd B l P
ge A t m d d 94 77

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Ard G Mo MD

W ns H S Ch i lithia i In St l l Cell An ml
A f i l f 945 S

Chol i th s i s t i f q ntly cases r v d n pa
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cell a ma i whi h gall t r d m trated
r tg n log call ar r po ted by the author

A r ew f the l t r t al a r e d f
ch lel th s i n s f 44 a t p y c a s f chl c ll
a em All i pat e ts w e l s th n forty y r s of
ag

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It s n t ble d that th r i s of s ckl ll
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c l c H ow it m pos bl that th bd m
mal symptoms m f th p t n t s a d t
ch l i thias nd asso iated g ll bl d d r disea s

The recognition of sickle-cell anemia as a cause of acute abdominal symptoms is important. The mere presence of biliary calculi in a patient with sickle cell anemia requires careful evaluation of clinical symptoms before operation is advised. In this series, the risk of surgical procedure is especially high.

The foregoing thesis on the negro, especially the young negro, demands a search for the presence of sickle cell anemia.

EARL O. LA MER, M.D.

R. G. and Cipoll. E. A. Study of Primary Cancer of the Gallbladder. (Cancer, 1945, 36, 1-945).

The literature on the subject of primary cancer of the gallbladder is reviewed. A case history is presented of a 58-year-old male seen at the Institute of Clinical Medicine, Buenos Aires, from October 19, 1940 to July 31, 1944. The frequency of this form of cancer was 5.1 percent of all the cases admitted during the period. Of the cases of the benign disease of the gallbladder, 39 percent of the 455 patients with gallstones. Of the patients, 72 percent were male, 28 percent female. Two patients survived the operation. The literature is reviewed.

Cholecystitis is considered a contributing factor to malignancy of the gallbladder. In 11 of the cases, the contents of the gallbladder were examined. Among the tumors, 87.5 percent were carcinomas, 5 percent epitheliomas, 5 percent villous, and 75 percent were of the infiltrative type. The site of the tumor was in 16.6 percent of the cases, in 66.6 percent it was in the fundus and in an equal number in the body of the gallbladder.

In 89 percent of the cases there had been a previous history of benign disease. In 67 percent of the cases, the disease was typical hepatic cirrhosis. In 67 percent of the cases, there was pain. In 67 percent of the cases, obstruction of the gallbladder and loss of weight in 89 percent of the cases.

The clinical picture of beginning cancer of the gallbladder may be similar to that of benign disease of the gallbladder and as a rule, a definite diagnosis is impossible with the pathological examination. The suspected diagnosis is supported in a patient with a history of cholecystitis, the pain, a dyspeptic symptom, or a decrease in weight. In 67 percent of the cases, the operation was performed after the beginning of the disease.

The degree of malignancy that generally is found in the gallbladder is such that a definite diagnosis is not possible. The operation is only a palliative measure for the gallbladder.

practically impossible. The removal of very gallbladder that contains stones has been recommended as a prophylactic measure. This is hardly justified as the frequency of cancer in the gallbladder is 5.1 percent (from 1 to 2 percent), less than the mortality from cholecystectomy and even if the gallbladder is removed, cancer may occur. The stump of the cystic duct. However, the possibility of the development of cancer in patients with gallstones should be taken into consideration in determining the indications for treatment of the latter disease.

ANDREY G. MOGANYAN, M.D.

Irwin, S. T. and Mori, N. J. E. Congenital Cyst of the Common Bile Duct Containing Stones and Undrained Gallbladder. (Bull. J. Surg., 1944, 31, 319).

The authors report the case of a thirty-year-old male who was operated upon because of pain in the upper abdomen and rigidity of the abdomen. The cholecystogram was normal. Through a gridiron incision on the upper abdomen, the gallbladder was removed.

Approximately fifteen months later the patient was operated upon again because of recurrence of pain in the right upper abdominal quadrant and jaundice. The gallbladder was somewhat distended and the liver was tense. There was a large tumor about the size of a fist in the region of the head of the pancreas. This was aspirated and found to contain bile. The cyst was opened and gallstones were removed. Then a tube was sewn into the common duct and a cholecystostomy performed. The patient failed to survive.

Autopsy was performed. The cystic and hepatic ducts were found to be normal in size. The common duct was dilated but a probe could not be passed into the duodenum. Histological examination revealed a squamous cell carcinoma which was believed to have originated in the common duct.

EARL O. LA MER, M.D.

Neg. A. F. N. T. I. A. E. M. I. A. T. I. O. N. O. F. T. H. T. E. R. M. I. N. I. A. L. P. A. R. T. O. F. T. H. B. I. L. L. I. T. Y. T. R. A. C. T. (E. P. I. R. A. C. G. F. A. L. D. I. P. C. O. T. M. I. D. I. T. B. I.) I. M. E. D. G. N. T. 1945, 37.

Attention is called to a mistake often made in cholangiography. Very frequently cholangiograms show a cystic duct infundibulum formation of the common duct which apparently would allow of frequent aspiration of the duodenum. However, frequent aspirations will often show that this is due merely to a contraction of the sphincter of Oddi and upon relaxation of the sphincter the passage of bile is again normal. No tumor can be seen in the malcontour of the duct. Therefore it is impossible to determine from a single cholangiogram whether a true obstructive lesion exists. The degree of the common duct or whether the apparent obstructive lesion is functional.

Two cases of cholangiography of the common duct described in these cases are of the type of the first and second type of the common duct.

still h e l o b t r u c t i o H e r c h l g i g m
t k e t h e t d a y s h o e d c m p l t r l t i d
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C h l a n g i o g r m f c a s e s i l l u s t r a t i n g t h e s e f a c t s a r e
g v e n

C d t i g i n B e g l a f o r t h c a f u l o b s e r v a
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k o v n A u d r G M M D

B e a s e G T h T i m e F a t i n t h D e l o p m e n t
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The a u t h o r p o s t s u p o n a s t i t c a l s t d y u n d
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m o n d u c t s e s d c a r c i o m f t h e g a l l b l d d e r
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t h t m e f a c t f r t h e d e v l o p m t o f b i l a r y c o m
p l c a t i o s m u s t s l t s e l f t o t h e t i m e l a p s e b
t w e e n t h e o n t o f p r i m a r y s y m p t o m s o r d e m o n s t
t n o f s t o e n d t h e c l i n c a l n s e t o f t h s e c o m p l
c a t o n s G a l l t o s e e s t m t d t o a f f e c t a p p i
m a t l y o e t h r d f t h a d u l t p o p l a t n

T h s t u d y s m a d e o f 26 p r i v a t e c o d s o f p e r
e r a t o n f o r g a l l t n e T h e a v a d u r a t o n o f s y m p
t m s a s h a d n t e n t h y r s O e h u n d e d n d
f i f t y s e v e n p e n t (6 p e r c e n t) p r e s e n t e d t o p r
a t i o n n o b l a r y d i s a s e o t h e t h n g l l s t o e s T h r
h s t r i e s r e v a l d t h t s y m p t m w e p r e s e n t f o a s
l n g a s t r t y n u n y a r s w i t h a n a v e a g e p e o d f
f o u r a d s t t h s y e r s

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o r m o c m p l c a t o n a t o p r a t o n i c l u d
a c u t e c h l e c y s t i t s a c u t e p a n c r e a t i t s c h o l d o l
l t h a s i s a n d c a n o m a o f t h e g a l l b l d d e r W h e r e
s t h e a r g e d r a t o o f t h e g l l s t o n e c o d t o
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w e r e a b s t w s s a d s e c n t t h s y e a r s i n t h e
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t m f o l e s t h a t o n e y e a r b f r e p r a t o n a d 47
p e c e n t f o l e t h t h r e y e r s

S i x t y m e p t n t s (27 p e r c e n t) h a d a c t e c h l
y s t i t s i c l d g e m p m g g e a d a c u t
f e p e r f r t n f t h e g a l l b l d d e T h e v e a e
d u r t i n o f s y m p t m s f r n d n n t t h
y e a r s h i h p c t c a l l y t h s a m e t e r v a l a m
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H A R R Y W F M D

G l A M f t l N e c r l l E l e c t r i c
S h o c k A h P t h C h 945 39 9

L t t l h a b n c f l r g a d g t h e c l t
f t h e p n c a s f o l l o g d e a t h f r a l c t r c a l h o c k

The a u t h o r m d t h e b d e s f 3 m e n o f m l t r y
a g e w h o d i e d i m m d a t e l y f l l w g e l e c t r i c a l s h c k
I n e a c h c a s e t h e p a n c a s s h o w e d f o c l s f
h m o h a g e a d h y p e r e m a T h e r e w f o c l r e s
o f c o a g u l a t n n e c r o s s I c a s e s t h c h a g e s
o c c u r d t h e t a i l t h h e a d a n d b o d y b g r m a l
i n t h e t h r d c a s e t h e e n t e p a n c w a s v o l e d

T h e a t h s u g e s t s t h a t m i n o p c r e a t i c h
m a y g i n e i m m e d i a t e s y m p t o m s h o c k t r e
s l i n g i n d t h b u t l t e r t h e y m y c a u s p c a t
i n s f i c i e n c y E O L r u M D

W a l k H n d B o g W P A d n m f t h
l i t s f l n g e h n w i t h l y p o g l y c e m l t h
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T h e a u t h r s r p o t 2 c a s e s o f p e n t s t h h y p o
g l y c e m a w h e r e f e l d o f t h e s y m p t m s b
r i g n a l r e m v a l o f a n a d e n o m a o f t h e p a c r e
T h y s t a t e t h a t 56 c a s e s o f c e s f l r e m l f
b e n a d e m a s o f t h e l e t s f L a g e h a n s h
n o b e e r e p o r t e d n t h e l i t t

A t t e t o i s c a l l d t h e d f c o d e g h
p e n a s l m f o n l v t b e r u l e d t a s a p o b l t v
n e e y n e r o p y h t r c c a s e H y p r n s l m
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o f t h c o d t o w l l b e f u r t h e d b y g e a t r a t t n
t o t t h a l t r a t i p r o d c d t h e d o c
g l a d S g a l r e m o l o f t h e s e t m r s i s n d c a d
a s t h e m o s t f i c t e t h e t r y w h i c h i s e d d t
p r e v e n t d a m g t t h c e t r a l r v o s y s t m
a r e s u l t o f l g s t d g h p o g l y c m
W T E H N M D

MISCELLANEOUS

B e n n m n n J A b d m i n l P l n i n C h i l d
J A m M A 945 7 69

A b d o m a l p a n i n c h i l d e p e t a m s t d
c o c e r t i n g a n d h a z d o s l n c a l p r o b l e m s i t
w r n g s g n l t a t s o m e t h i g h g o r o n d
u n f o r t n t l y a t t m e s t h a t m t h n g m y b
s e r i u s T h e v e r y f c t t h t h e i c e d e n c e f o d
t o n s w h c h a e n t s e r u i s m c h g h e r t h a n t h a t
o f c o d t i n s w h e g r e v e m y l a d t l c k f
w a r i e s s e u l t n g c a t a t r o p h T h d f f t i a
t n c a n o b m a d e s a f e l y o t h e t e l p h n

B r e m c l s s i f i c t h e m j r i t y f t h m
s e r i o s a b d m i n a l c o n d t n h l d d d c c o m
p n e d b y p i n t t w o m c a t o e s t h d e
t b s t r u t n a d t h s e d e t f c t E a b
t y p e p r e s e n t s t h w c h a r a t t e c s g s d s y m p
t o m s t h t v e r y o l y i d g r a t h e t h a t h
n a t u e f t h d e l y i g c o d i t

W h t h e o b t r u c t t o a y h o l l w c u
w t h a m s c u l r p r p l s e m h m t h r
t e m t t e t p u n w h c h m y b e r y s l h t r y
t e a c c o d i n t o t h e d g r e e d s d d n e s f

the obstruction. If it is sudden and complete the pain is agonizing especially at the start and there may be shock. This is known as colic no matter what the underlying cause. There is very little tenderness. Pressure is often a source of relief and is not infrequently self applied.

If the obstruction on s p a t i a l and gradual in onset the p i n varies with the deg ee of obstruction. It is al w a y s intermittent i t may be almost negl i g i b l e yet i t may be severe. Hyperpe t a l s i s and d i s t r i b u t i o n finally atony if too long continued supervene prox i m a l to the point of closure h e r e a s at o p h y and c o n t r a c t i o n occur d i s t a l to i t

I co d b o n s due to i n f e c t i o n t h e p a i n i s m r e c o s t a n t a n d u n f o r m u l e s s t h e i s c n c u r e n t o b s t r u c t i o n I n t e r m i t t e n t p e r i o d o f g r e t e r p a i n w i l l t h e n m a n f e s t t h e m s e l v e s I n d e r n e s s i s a l w a y s p r e s e n t o v e r t h e a f f e c t e d a r e a a d a m o r e p r o n o u n c e d t h a n u n e l i c t p a i n

CONDITIONS PRODUCING ABDOMINAL PAIN IN CHILDREN

Obst et s Among the congenital intestinal obstructions are those due to atresia and stenosis bands or contraction fetal peritonitis malrotation of the midgut and meconium ileum in which the ileum is almost irreducibly movable rubbery mass of meconium throughout the intestine leading to a pancreatic deficiency

Pylosis *st nos s* I pylor c st n sis ther is a gradual and part al bstru ction There s th efo e only sl ght pa n usually ot ro gh to m ke the n fant cry Th re is only n obvious d omfort as show by the wrinkl d br the l ok of apprehe sion d the st ppng of urs g s e ch new p sode occurs c d tal with the app ara ce f ma imal perist ltic gastric va es a d the app oach f proj ctile vomit g

Colic The c lic of infa cy in a class by ts lf
Th pa n is ag iz at d fi tely i tr m tte t
P essure is grat ul s n the clics f r s me un
e pla ned reaso it t d st occur at b t th same
tm ach day usu lly th late ft n n realy
e eni Th f q cy with which it occurs nly
d r ng the first mo th of l f e ha led t th term
three months c l c C l c as fr que t r m r
f q t i th bre t fed as n the a t f ally led
i f nt Thed tenti by g f om bum m lk may
it elf b a caus of se e pai ned pos bly f me
ch n cal obstru ti n It s ms t u lly that
acut bstruct m y res lt from k nk g o b nd
i g n itself of the o rd st nd d test ne in the
cramped pace i wh ch t l R l e f that oft n
t m s f om n n m or sp t burst of
ft tu o firm the ca e

le te f st al ob t ch I t ss c pt is the
most f q ntly occur g typ of acut i test l
obstru to It r latu ely r e after th first ye
of life nd espec ly ely r the e nd I lm t
nooth r c ndit on does th m the u ally st t f
ex th u at wh h the pa began I th o r s
s m hours the pa s b c me less se c e a rule

the child does not cry out as before. With each recurrence he merely squirms through himself to one side, doubles up, whimpers, moans, or sighs. If he usually becomes so distinctive that it too is of diagnostic value. The infant appears calm, too calm, pays little attention to his surroundings, and yet he seems preoccupied and apprehensive.

The blood in the stool often only in a second one brings about renewed interest. The sausage shaped tumor which is pathognomonic in this clinical setting may be found anywhere between the ileocecal valve and the rectum. It can nearly always be made out by palpation without an anesthetic if one has patience, gentleness and a warm hand. Tenderness is only slight. A rectal examination on all days revealing and may clinch the diagnosis.

Sudden and complete intestinal obstruction from any cause such as strangulated hernia, volvulus, paralytic ileus, congenital or acquired bands, or Meckel's diverticulum may present much the same pain and other signs and symptoms which occur with intussusception except that there is no blood coming from the rectum and no sausage shaped tumor.

tumor intestinal obstruction The pain which occurs with chronic intestinal obstruction due to congenital bands or narrowings to tumors to postoperative adhesions and contractions and to other similar conditions may be negligible. On the other hand it may be fairly severe according to the nature, the rate of development and the degree of obstruction. It is always intermittent. It occurs with each new contraction of the intestine. The diagnosis must be based on the whole clinical picture.

Congenital anal or rectal stricture Co genit l anorectal str ictur is n t a rare cond tion The obstruction is d e to an l complete fus on of the descend ng mes nter n and the asc d g p octodeum during tal f e with a resulti g i n diaphragm or sickle shaped protrus on from the rectal val into the l me of the intesti e at a point rarely more than a c ntmet r above th sph ncter ar

Often by inserting a large finger each time over a period of days results in cure.

Obstruction of the renal and gall
 ducts is never encountered in a child
 unless the biliary ducts are also
 obstructed. In the case of the renal
 ducts, the obstruction is usually
 congenital and is due to a
 malformation of the duct itself or
 to a kink or twist in the duct.
 The obstruction may be partial or
 complete. In the case of the gall
 ducts, the obstruction is usually
 acquired and is due to a stone or
 to a stricture of the duct. The
 symptoms of obstruction of the
 renal ducts are usually pain, hematuria,
 and pyuria. The symptoms of
 obstruction of the gall ducts are
 usually pain, jaundice, and
 fever.

Appendix 1: Because an aly and immediate diagnosis is important and may be vital for the exclusion or establishment of the diagnosis

of appendicitis. While the diagnosis based on the mode of onset, the characteristic pain tenderness and vomiting, the low fever and the usually significant leucocytosis is often easy, it by no means always so.

The appendix is an insignificant little organ of serious importance only because of its location in the peritoneal cavity. When inflamed it very rarely causes intense pain or more than a few days of fever. As in the adult the pericommunity state in the region of the umbilicus and after a variable period it shifts to some other part of the abdomen usually to the right lower quadrant. The tenderness is always at the point of maximal inflammation and is of great diagnostic value in the spontaneous pain. Early posttenderness is the gleam of an important diagnostic sign. Redness is not an essential factor in the diagnosis of uncomplicated appendicitis. Rebound tenderness is a sign but merely indicates that there is an intraabdominal infection.

Diff *ent* *i* *d* *ag* *s* *s* *nd* *t* *i* *uses* *f* *bdo* *t*
p *r* *n* *t* *The* *pa* *of* *a* *diaphragm* *t* *c* *p* *un* *sy* *f*
g *h* *t* *lob* *pneum* *i* *may* *b* *referr* *d* *t* *th*
r *ght* *pp* *er* *quad* *a* *t* *of* *the* *bd* *om* *n* *and* *mul* *t*
the *pain* *f* *append* *i* *s* *The* *p* *n* *i* *s* *a* *l* *l* *y* *great*
than *the* *tenderness* *and* *s* *fo* *d* *high* *r* *in* *the* *ab*
domen

A beginning peritonitis due to perforation of an ulcer in Meckel's diverticulum can hardly be differentiated from appendicitis unless it is accompanied by a hemorrhage from the rectum.

Torsion of a o arian p d l n the ght de
gives much the same type of pai and thr symp
t ms as those p oduced by n inflamed ppendix
A very h g h l uocyte cou t or th ea ly find n f a
small hard fa ly tender mass h g h n the ht d
on rectal e am at on sho ld mak o th u k f n
tw t ted ped cle The first p emen tru l p f n
dolesce t g l e c the i te m strual m tt l
schmerz of a ruptu ed o a n f ll cle n the ght
d d may have to be consid ed

Mese t nclymph d t so c lled p m rype
t t as ll d ry l tub r ul per t
n tus m t lo be co d l
S A Z M D

Ud nd C B a d C te M R C trect my
nd Decalc ification f th Sk l t n (C t t
m y d l fi ci sq l t) P m d
f l 945 3 3

Th gast cju cc h s b sh n e p e m ntall
to be impo tant f ct i the al o p t i o n f cal
c m d p h s p h o r u i th i t s t n e l t f l
that dec l f i c a t o n o c c d i n d o g s f i e e m i f
th s t o m a c h s c o l d b m e d e d p a t i a l l y b t
n t e m p l e t l y b y g i g s l u b l e c a l c m s a l t s

Th a th rs mad a ca ful study f f t p t t
w h m gast ctomy had been p rformed t s
w h r th was true i hum n b g s al o Th
m d ntgen aminat o s of th l mb ac la d
p l b nes as the e a most f quently th s te of
d cal ficat They g t bles sho i g the ch f
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m n t i s of the m ral m tab lism a d also
t g n g ms of th bo es The f and th b o es
t be n m l o ly 2 ca es (487 per ce t) wh
t he w re ary i g deg es of d cal ficat
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[illegible]

In decid go a gastrect my all f th se fact rs
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 m mb ed th t it s b tte t p ve t d c lc fca
 t f po ble r thr r th n to ttempt t
 u t l p y GM c MD

GYNECOLOGY

UTERUS

T Hind R W The Surgical Treatment of Prolapsed Uterus J Am Med 1945 127 49

In the group of relatively young women suffering from a second-degree prolapse who do not desire more children the author finds the Spalding Richardson composite operation of particular value. The technique of this as yet little known operation described. In addition to giving very satisfactory support automatically stabilizes the uterus and prevents future deliveries from breaking down the extensive plastic work. The author definitely objects to the Watkins transposition operation, this group of young women too many years ahead in high third-degree prolapsed uterus may develop benign or malignant disease and when this occurs the uterus can be removed only with difficulty.

The largest group of women who present themselves with uterine prolapse and vaginal relaxation so that they are fifty years of age. He agrees fully first-degree prolapse present the Mhes operation serves well in the cases in which the uterus is healthy. Where a third-degree prolapse exists and the patient is a good operative candidate he prefers the Spalding Richardson procedure. This operation however is rather prolonged and should not be done if the physical condition of the patient indicates that a tentative operation would be ill advised. In these cases the Watkins transposition operation is quite satisfactory provided the uterus is healthy and the perineal size is small. Specifically satisfactory when the cystocele is large and the uterus is rather large but the prolapse is too small to be effective. The penning through the bladder has been recommended. The fact that the uterus may be preserved is a future consideration. In these cases the author believes that the cervix is important in the possibility of great distention of the uterus and the compensation for by the stretching of the peritoneum and the hernial inguinal peritoneum is contraindicated.

When prolapse is associated with existing disease such as small fibroids or functional bleeding gynecological hysterectomy in most cases the peritoneum is not helpful. However in the small fibroid is as far as the distention of the uterus is concerned it can be compensated by the corpus uterine and perform a Spalding Richardson procedure.

In the group of trapped children with large tumors of the ovary in such cases the hysterectomy is not a combination of the plastic operation and the cesarean abdominal surgery.

When a third-degree prolapse descends to the level of the iliac crests and is not preferred surgically but is fatal for very limited surgery.

gery the LeFort colpocleisis is quite satisfactory if the patient has no further interest in sexual relations. If the patient desires to remain fertile a vaginal life a fully satisfactory functioning vagina can be preserved by performing a partial colpocleisis and perineal repair described by Coid II and Powers. EDWARD L. COIT M.D.

Aubach S H and Pund E R Squamous Metaplasia of the Cervix Uteri J Obst 1945 49 7

In order to observe the incidence of squamous metaplasia and find some etiological factors data have been recorded on a series of more than 600 cervical smears obtained for the past few years. The cervix were fixed in toto and sectioned serially and the external os at intervals of from 2 to 3 mm.

Squamous metaplasia as been described in 72 of 100 cervixes in smears varying from minimal (+) to maximal (4+) the latter representing almost complete transformation of the columnar epithelium of the cervical canal. Racemous metaplasia has no effect on the incidence. The youngest patient in this series is twenty-one and the oldest fifty-one year. There was a noticeable increase in incidence from the third through the fifth decades and there was emphasis on the coexistence in the majority of the cases. There was no correlation between parity and the presence of metaplasia of the epithelium. Metaplasia of the cervix is a noncontagious process. Gross appraisal of factors involved on the basis of the fresh specimen and they refused to be without effect as factors. There was suggestive evidence of a correlation between chronic inflammation and the occurrence of metaplasia of the epithelium. The cervix evolved together in 30 instances while inflammation without metaplasia as seen in 9 cases. The latter cases included some instances of monocyctic disease usually with ulceration so that the metaplasia probably developed independently of high metaplasia without inflammation was observed in 42 cases. In active carcinoma occurred in the cervix. In both cases there was metaplasia in addition to the leukoplakia but the topographical relationship. The cancer cells treat the metaplastic epithelium with the same direct response shown the normal columnar epithelium uprooting and displacing the former beneath.

It is the authors opinion that chronic inflammation plays an important part in the process that the figure indicates although its mechanism as a local stimulus is vague.

It was not uncommon to find isolated patches of metaplastic squamous epithelium in the area of the local nodal infiltration while the surrounding area was almost entirely unaffected.

Whatever the etiology a definite significance of the metaplastic epithelium it seems to bear no relation to

t m ligna t d case e cept f r a pos ble common
a cestral cell L D A R D L C Y E L L M D

ADNEXAL AND PERIUTERINE CONDITIONS

Gallucci J W lffian tum r (T m lff)
Rev b t g S P I 944 7

In connecti n with thi discuss on of t mors of th
lffian body the mbryology f the o g is
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h t pedicle and become nt bd m n al r th y
maj ema n i t al game tary p p ly spe k g
Th o ary may ema n compl t ly i d pende t f
t th mor and n r m l i form t m y b come t
t ch d to the t m r and becom l g ted f the
tumo grow to l ges ze S met mes there may be
cy ts of both t o a y d p o a r um The
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m y be solid The tube may gr o t ove th
tum r like the cest of a helm t It m y b cl
gat d to as much as 30 or 4 cm d almost
round the t m r Bet ee the t mora d the fold
f the larg l gam nt there is a loos t ss eth t con
titutes a pla e of cl a age wh ch may be ut li ed
mo ng the t mo The cysts may b small or th y
mav c n t a much as 2 3 c e e 40 l t e r s f
l q id The liqui d is clear and d es ot conta alb
m n mucin r ps udomucin It contains sm ll
am unts of alkali n sulfates chl ates and c
bonates and som times large am unts of l p o d
wh ch g es it a yell wish o gre nish lor

The e tumors m y g e r e t o th ame compl ca
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n gangren ruptu intracyst c hemorrhage and
malg ant deg erato s as well as t r s o of the
ped cle O e ca i reported in which such a t mo
he n ated thro gh th right crural ring

These tumors mu t be d ff rent t d from t mors
f the ovary coll ct n of infl m m tory fluid in th
per t e l c v a y and other i r l g m ntary t mors
uch as fib m ct pic p g cy chorioep the
l m and hydatid cyst Th p g n s s is g ne ally
g od as they r a ely sho malg n nt d ge e at

T atm nt g cal a d is easy whe th t m
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pened and th t mo n cle t d l n g th plan of
cle v g e C m st be taken t p nt rupt f
th cyst If ptu e ccurs the inne surfaces f th
cyst may be uti d t g the to furth c cat zati
th muco a linu the cyst may b xti p ted b
Lope tech que r the dges f th c st m y b
s tu d to th p etal perit n m a d the ca ty
t mponed D ingop at o c m p l c t o s uch as

j ries of th bl d r i ntest es ureters
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If m h ge may be f m the t r o ara
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ces tat s add m alor g lt mpo g

These t m rs may be compl cated by p e g a
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Among i 3 t m rs of the r y s at th
Gynecological Cl c of the U i r s ty of Sao Paul
di cted by Mo Barre s p d t bet m rs f
the parova m d i a M g g hydat d (3 33 pe
ce t f the t m rs f the r y) The ge f th
p t e s va e d f me e ghten t th rty v rs
ln 3 cases th t m na th r ght id a d n z
n the l f t The t mors we n r l g r th n th
h ad of a f t s a t m e 4 ca es they re betw
th fold f the mes alpi a d t m r i tra
lg ment ry prop e l y spe k i g i 3 cas s th tum r
s remo d a d salp g ct may p fo m d f
ca e the cyst rupt red ble l p n gect my s
bei g perf rm d A D R X G M CA M D

EXTERNAL GENITALIA

Sch uff r G C and Sch fl C Current Co
pts f v g l n t i a d v u l i r r i t a t i o n s i
I fant and Child en B i f S g 945 53 35

The ca ses f r r i t a t o n in the vulv a r e a n
f nts and child en e () s m p l f i l a r a d n g l e t
(2) dap ra h (3) fectio by b c t i a i clud
g no hea trichom and mo l (4) traum
ngestio foll wing mastu bat (5) inflammati
c n t i n g a b t p h m o s s (6) d a b e t c d r m t
t s Mo t infect s of the v l a a re seco d r y t
ag al i f t o of wh ch a e t u m a t e d 60 t 7
per cent a d to the go co c u s Tr atment f
the vulva i s t s f c n t o l f t h i f c t o n a d
l cal cl ansu w th an em ll t w b

The g u n a is us e p t b l to n f c t i o beca
f i t s r u g u c r y p t i f o r m n f r m a t s a d t s
at p h c m e m b e The e r v the immat r
female is not a harb r for f t

Bacteri logical infectio s f th ag i a e l t
fr m direct tra m s on of w t a c t e i f e t e
discharge A child s u l l y n f e c t d f r m d r y
line t l t s a t s e p l a y r d i r c t a t i f o m
i n f c t e d d l t The s a l y m p t m a e m k e d
redde n r e t c h g d t h c k p u l n t
typical ag u l d charge R ly th e i s n a
t o n a d b l d g The d g n s i s b s e d p o a
c a r f u l h i s t r y P h y c a l m u n a t n s m d e b y
c o m b n d c t a l d a g l e a m t o b c t o
l g i c a l m r s d c u l t e d a c o p y P o s
t c u l t r e m y b e o b t a d o l y a l t r t h
f o r a t t e m p t s

A h g p tag of h l d r d r g p o t a
c r s A t v e t a t m e t i n c l d the s f l f
d r u g s p i l n t g c s b a t a c e d l c a l
t s p t c a p p l i c a t o s S u l f a t h i a z o l a d s u l f
d a z i n a e s e d i n d s a g e s f g g r f r c h l d r u

de s ven years and in dosages of 7 gr for chl
dren over se n years g en e cry fo r h rs Th s
is co t nued for a period of from seve to ten days
when the culture is repeated P nic lin is give in a
dosag of 200 units p r k logram i t am cula ly
every three hours until from 8 to 12 doses have been
g e although treatment may have t be p long d

Estroge c sub tance g v n in the fo m f sup
post i s co tain g 200 I U wh h are nsert d
n ghtly unt l the cultu e is n gat e The authors
object ons to this type of therapy are that t is t o
exp si e that it requ s too much ma pulation
ith bad psycholog cal eff cts a d th t occasionally
bleed g occurs

Persu tent infect n w th pos tive bacter log cal
find gs sh uld b made sub j ct t altern ti r
mu ed types of treatment Gonorrhea occas nally
affects the rectum ith a res ltant proct t s h ch
po ds ll to azochloramide

I the authors xpe nce foreign bodies includ
ing wood b ans and h irp ns we e comm n cau s
of tra matic vag n tis Diagn sis was e sily made
by r ct vag al e am tio One finger was in
s rted nt the ectum a d an appl cat s us d
in the agina R moval of the fore gn b ly s
most successfully ccompl sh d v th small tooth
less forceps under g idanc of a r ct l f g

C TH RCE B H M D

MISCELLANEOUS

Ped rsen J Stud es of Men truation Anomal
Fertility a d Androgen E cr ti n of N mally
Halred d Hyp rtrich t c W men A i b i
ty c nd 943 2 38

In the e d rin d sea es i which the typ
cal hypertrichos such as C shi g dis sc d

viril ng tumors of the suprarenal corte menstrual
anomal es and sterility are fr que t It has been
generally a sum d that these an males are more
freque t in hypertr chot c women than in omen
with norma l har gro th without a y def te
study f the subject

The author bas the efore made a rath r crtical
study f the que t on He considers 8 regions f
the body that normally have some har and f r
deg ees of hairness

- 1 Cl ss cal normal hair growth
- 2 Sl ght hairness w thout hair at the linea alba
- 3 Sl ht hair s ith hair at the linea alba
- 4 Decided hairness

In th examination of 3 8 f males over thirteen
y ars of age he fou d that the greatest number f
menstrual anomal s occurred in the hair est indi
iduals H also found that subjects with linea alba
hair h d more fr quent menstrual nomales than
those th the same degree of haring but with no
l nea lba h ir Th re was no difference in fertility
in th normally haired women and those with hyper
t chosis

Among 64 wom n in whom andr gen excreti n
was dete mi d the highest average excret on was
found in the very hairy subjects It was f und also
th t th sl ghtly hairy w th l nea alba hair had as
high androge e cretion as the very hairy The
hyp rtr chot c women had on an average of 50 per
cent more and og n excretion than the normally
h irv

For the d agn s of hypertr chosis as a sign of
and ogen eff ct it is sufficent to find linea alba hair
because the linea alba is always hairy w th high
a drogen e cretion no matter whether the other
r g o re found to be hairy or not

A E G Mo G \ M D

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

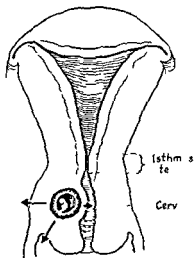
Studdiford W E Cervical P gnancy *Am J*
Obst 945 49 60

The author presents 18 case reports on cervical pregnancy from the literature and 2 from his own experience. It is most probable from the evidence which has been presented that on rare occasions the fertilized ovum traverses the uterine cavity before the cervix has fully developed and having reached the cervical canal embeds itself in its mucosa. The depth to which it penetrates is variable as is the level at which it undergoes division. Probably complete penetration of the mucosa takes place in the chorion frondosum develops in relation to the mucous lamina. It seems likely that many of these pregnancies may terminate spontaneously at a very early stage because of the unfavorable site of nidation and the reflex escape of the embryo.

Cervical pregnancy is a definite though a entity. Many cases may be recognized. Such pregnancies are rarely carried beyond the twentieth week of gestation. It is necessary to intervene surgically before the fifth month because of hemorrhage rupture of the amniotic sac or perforation of the cervical wall.

Profuse and violent hemorrhage accompanied the attempt to remove the placenta.

Enlargement and expansion of the cervix accompanied by bleeding in the early months of pregnancy



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Barnes and Bohn in this article present the
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significance between the null hypothesis and that the difference between the mean of the sample and the mean of the population is zero. The null hypothesis is a statement of no effect or no difference. The alternative hypothesis is a statement of an effect or a difference. The test statistic is a value calculated from the sample data that is used to decide whether to reject the null hypothesis. The p-value is the probability of obtaining a test statistic at least as extreme as the one observed, assuming the null hypothesis is true. The significance level is the probability of rejecting the null hypothesis when it is actually true. The power of a test is the probability of rejecting the null hypothesis when it is actually false.

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J R ERT WILSON M D

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CATHERINE B. HESS, M.D.

Hamburg, R. G. Contribution to the Histomorphology of Hydatidiform Mole and Choriocarcinoma Based on 76 Cases with Histological Analysis. *Acta Obstet. Gynec. Scand.* 943: 4-45.

Soon after the development of the Aschheim-Zondek test for pregnancy and Friedman's modification of it, it was found that pathological changes could be brought about with much smaller amounts of urine from cases of hydatidiform mole and chorionic epithelioma than for cases of normal pregnancy. This suggested the possibility of histological diagnosis of hydatidiform mole and chorionic epithelioma. The author investigated this question on material from the Hormel Dispensary of the Stat Serum Institute of Copenhagen, finding 76 cases of hydatidiform mole or chorionic epithelioma and 71 cases of normal pregnancy in which no such complications were found.

He found that quantitative determination of the excretion of human chorionic gonadotropin is of very limited use; the diagnosis of hydatidiform mole as it is impossible to establish the upper limit of normal values. Nineteen one million international units of gonadotropin per liter of fluid finally prevails the presence of hydatidiform mole. However, the gonadotropin excretion has certain value; namely, the maternal excretion of gonadotropin is 6 per cent of the patients with normal pregnancies should be gonadotropin excretion of 300,000 or more international units per liter while 8 per cent of the ewith moles excreted more than this amount.

In uncomplicated cases of mole the gonadotropin falls off rapidly and after a month is very low. In the 3000 international units of high excretion found for this material, the percentage of cases of hydatidiform mole is 50 per cent. The author found that the maternal excretion of gonadotropin is 6 per cent of the patients with normal pregnancies should be gonadotropin excretion of 300,000 or more international units per liter while 8 per cent of the ewith moles excreted more than this amount.

In the 3 complicated cases of this material there was a protracted gonadotropin excretion which showed a tendency to rise rather than to disappear after the first month and there was an excretion of 3,000 international units more a month after removal of the mole. Periodic determinations of gonadotropin excretion should be made at least six months after removal of the mole. If microscopic examination of the mole causes suspicion of chorionic epithelioma, the control examination should be made at intervals of one or two weeks.

AUDREY G. MORGAN, M.D.

Strauss, R. and De No, G. N. Effects of an Abortion Inducement Paste (Ultra-J) on the Post-Death of Its Use and of an Experimental Study of Its Effects on Rabbits and Rats. *Arch. Path. Ch.* 945: 39-9.

The death of a young woman due to an abortion, the use of a paste and the medicolegal angle involved stimulated the experimental studies described in this article.

The paste or jelly is a whole and its component active elements introduced in laboratory animals and mixed with whole human blood and the effects are described principally from a histopathological standpoint.

When mixed with human blood the cellular structure of the blood becomes lumpy and a immediate color change is observed. The prepared coagulum after fixing staining and cutting histologically presented a complete loss of cellular elements being replaced by amorphous dead cellular masses.

The introduction of the material into the horn of a pregnant rabbit produced death within a week. On examination the uterine cavity was found to be empty and a perforation was found at the site of application of the paste. Section of tissues microscopically studied revealed an extensive necrotizing inflammatory process.

In animals which survived no marked evidence of damage was found. The uterine wall in the injected sites revealed an inflammatory infiltration of the wall of the horn.

The paste had a definite caustic effect and produced temporary irritation and the effects had taken place in the cases reported. K. A. BECK, M.D.

GENITOURINARY SURGERY

ADRENAL KIDNEY AND URETER

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catabolism especially when considered in conjunction with the speed at which weight is lost by these patients. There is no doubt that they all suffer from dehydration and oxygen deprivation due to anemias, vasoconstriction and reduced blood volume—facts quoted by Black as increases of tissue protein catabolism. It is therefore probable that the manufacture of urea from tissue protein is abnormally rapid after severe traumatic hemorrhage.

It appears that the condition may be relatively common in modern warfare especially when severe damage to a limb involves large blood vessels. Evidence is given that the manufacture of urea from tissue protein is increased in the early stages of the illness and therefore is advanced in support of the view that urea retention is due to renal anuria. During the recovery phases of uremia is pronounced and the usual renal function tests may show no abnormality. Simpler tests revealed kidney impairment; one of the cases described. One patient had severe leukopenia as a result of sulfanilamide poisoning and responded rapidly to injections of pituitary extract. J. H. E. KIRK, M.D.

Leadbetter W. F. and Engst H. C. The Problem of Renal Lithiasis in Central Pituitary. J. Urol. 1945 53: 269.

Fourteen cases of hematuria with renal and ureteral colic due to the passage of calculi or sand occurring among convalescent patients in a military hospital are reported. Hemipituitary was required by use of jejunal rounds in 12 of the 14 cases. Eight of the patients had bone injuries in addition to soft tissue wounds. In 3 cases amputations had been performed. With exception all patients were immobilized more or less completely for several weeks. The time between injury and onset of the urinary symptoms varied between eight and one hundred sixty-four days with average being seventy days. Bilateral calculi were present in 8 cases. In patients with unilateral calculi the right was found in 5 of 6 cases. X-ray examination in 9 cases disclosed radiopaque stones in 3 instances non-functioning kidneys in 5 cases and hydronephrosis in 2 cases. Intravenous pyelography as the most useful diagnostic procedure. In 9 cases cystoscopy performed a ureteral obstruction was demonstrated in all 9 patients and immediately relieved. Obstruction which could be diagnosed by the term calculi demonstrated in 14 of the 14 cases. The obstructive agents were usually small aggregates of crystals. Amorphous material. Urinary sediment of hematuria and large amounts of amorphous crystalline calcium phosphate sediment. In no instance was the sediment found in the urine with high specific gravity. In 13 of the 14 patients played a role in the formation of the calculi. This series of fifteen cases of hematuria with renal and ureteral colic demonstrated that the majority of the patients had a high degree of immobilization of calcium phosphate from the skeleton with consequent increase in the concentration of

these substances in the urine when combined with a low intake of fluid and a dependent position of the renal pelvis. Attention is called to the adequate administration of fluid particularly during the early period of bed rest and the turning of immobilized or paralyzed patients is frequently as prophylactic procedures. WILLIAM W. SCOTT, M.D.

LeDuc I. E. Ureteral Syndromes in the Male. J. Urol. 1945 53: 95.

One hundred consecutive cases in which the diagnosis of ureteral disease was made from the basis of this study. The number occurred in a total cystoscopic material of 366 patients and a total admission of 15,465 patients in a military hospital of which the identity local and geographic and climatic environments are not disclosed.

A congenital origin of the diseased condition of the ureter he clinically determined was probable in 37 instances—in 8 with a lifelong duration of symptoms and in 9 patients with a history of enuresis but not included in the group of 26 enuretic patients. In 5 of the 10 with a presumably acquired syndrome the onset of symptoms began with a gonorrheal infection. 6 dated the symptoms from an acute renal infection. 4 dated them from an attack of some contagious disease. Foci of infection were found less than expected only 4 dental 16 tonsils and 4 poststatic infections being discovered. A small group of patients attributed their symptoms to trauma usually a fall or blow on the lower testicle while in a few cases the symptoms began after a sudden lift strain.

In an attempt to define a characteristic syndrome for this condition the hundred patients in this group of young soldiers were divided into five groups according to their predominant complaints. It being understood of course that this was not an attempt to separate the patients into different disease entities (since close analysis will show a general similarity of symptoms and signs) but merely to characterize a general syndrome from various approaches. Thus the predominant symptoms in 3 of these patients was renal pain that backache pain on pressure and dilatation of the bladder manifested on percussion over the kidneys. Symptomatically the patients complained of enuresis 16 of appendicitis (or identity muscle spasm or rebound tenderness) 14 of testicular pain 14 of hemipituitary and 5 of miscellaneous manifestations. The diagnosis of course depended essentially on cystoscopy with nephroretrograde pyelography (15 per cent koden) and the retrograde fluorescent dilatation. In no case of the ureters per se. The diagnosis of the ureters was made by the retrograde pyelography. The retrograde pyelography had to the therapy of Schreiber and the retrograde ureteral wall caused by adjacent conditions.

difficult to determine and implementation of the needles may not be adequate. The bladder collapsed to permit reduction of the normal bladder mucosa.

A new method of internal radiation of bladder tumors is described by the authors. Under spinal anesthesia a careful bilateral examination is undertaken to determine the site of the tumor. Previous cystoscopic voiding is also at hand. If the tumor can be palpated percutaneously or vaginally through the perineal external approach to the tumor is undertaken. If the tumor is above the trigone the bladder is approached suprapubically but is not opened. By means of a balloon, the bladder which can be filled is emptied to assist in mobilization of the bladder and to ensure of the site of the tumor is made possible. Whatever the approach, radioneedles are inserted into the tumor approximately 1 cm apart and the strings attached to the pedicles are led out of the incision. A urethral catheter is placed in the bladder in such a fashion that the bladder is always partially filled to prevent distention of the normal bladder. The other tissues are protected by vessel gauze packs inserted at the time of operation. The duration of irradiation is determined by the size of the tumor and the number of milligrams of substance used. The total dose is usually from 10 to 50 threshold erythema doses. Removal of the gauze packs and drainage of the bladder is accomplished with difficulty.

These methods have been used in 6 cases in which the vagal discharges suppress each other. The results obtained by the authors to indicate the method used in these 6 cases but they offer a theoretical proof of the efficacy of the method.

WILLIAM W. SCOTT, M.D.

GENITAL ORGANS

D I P n A and D la Pena E Tub cul si f
theP stat B t J U l 044 16 5

The location of the prostate gland between the
 primary tract of the genital tract and the rectum
 explains the frequency of the involvement of the
 prostate by tuberculous. Tuberculosis of the pro-
 state without involvement of the peritoneum of the
 genital tract is so called primary tuberculo-
 sis of the prostate. It is extremely rare. It is generally
 regarded that tuberculous infection of the prostate is al-
 ways secondary to a tuberculous focus elsewhere in the
 body. The prostate is commonly involved in the
 blood stream and the urethra the latter being the
 commonest route. When the epididymis and the
 prostate are involved simultaneously the prostate
 is infected by extension via the duct system.
 Primary tuberculous infection of the prostate is
 logically tuberculous infection of the prostate may take
 the form of small tubercles that flagellate
 bacilli are little seen. The glands
 with calcification of the prostate of tuberculous
 infection. The glands are usually bony
 thickened histologically and contain a few mi-

Fight cases of tuberculosis of the prostate gland in 714 which the ewa ac e sti g en t ube r cul os is a e p e s e n t e d . In o n ly 1 case was there no s i g n of urinary tuberculosis . Th s patient had had a pul mo a ry and gen tal tub e r cul os is wh ch had appar e n t ly h e a l e d . The prostate gland was compl t e ly calc f d . h e n the patient was exam i n e d . T al destruction of the p o s t a t (forebladder) is always the r s l t of re al tub e r cul os i s . Removal f the renal focus usu lly result in the h e a l i n of the pr s t a t i c p r e s s . So-called forebladder results in in c o n t i n e n c e of urine which m y d s a p p e a r s s p o n t a n e o u s l y or may requ r e s u r g i c a l t r e a t m e n t (Lowsley s p e r i e l i c a t i o) . H e m a t o c y t a r i n v a s i o n of the p o s t a t e w i t h o u t i n v o l v e m e n t of the u r i n a r y t r a c t m a y h a v e a b e n e f i c i a l t h o u g h t h e r e i s a l w a y s the p o s s i b i l i t y of tub e r c u l o u s m e n t i s a s a r s u l t of s e x u a l e x c e s s .

Diagnosis is usually made by means of cystourethrograms. Treatment of tuberculosis of the prostate should consist of eradication of other foci, especially an infected kidney—and general measures (the administration of calcium vitamins) together with continuous oral or intravenous administration of copper or a compound.

DOYALD F McDONALD M D

Ve m o t n V T ticul Tumo s A h S r 945
5 63

A statistical analysis of a series of 62 testicular tumors occurring in two groups of patients. The first group consisted of 27 patients who were reported to have an increased incidence of testicular tumors. The second group consisted of 35 patients who were reported to have a normal incidence of testicular tumors. The results of the analysis are as follows:

Group	Number of Patients	Number of Testicular Tumors	Percentage of Patients with Tumors
Group 1 (Increased Incidence)	27	6	22.2%
Group 2 (Normal Incidence)	35	16	45.7%

The results of the analysis show that the incidence of testicular tumors is significantly higher in Group 2 (45.7%) than in Group 1 (22.2%). This suggests that the incidence of testicular tumors is not necessarily increased in patients with a history of testicular trauma or infection.

Of the 62 tumors 1 p d t b b n g n Of 51
cas s of malg a t t m r only 5 sh w d e v i l n f
m t a t s e s w h e n t p t t w s f i r s t h p t l d
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m a t c d f o l l s d b c h e t o m y P r e p e a t e
a d t o s n t a d i s a b l e b e c a u e h i s t o l g i c a l
m a n u n o f t h e r r a d t t u m o r m a y b e u n s a t i s

Th s in turn reduces the st mulat on to the pr stat c
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Th basement m mb a e can b m th ck n d
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✓ seminiferous tubules Ar t f p m t g
nearly al ays is complete or almost complet

The appe dix testes which are embry lo c l
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d finit arr gem t l some a s th e a no
nucle a d only cell remn ts es en

All th e sid effects h ch ha e been described
off r no and r by which m y det rm th m
s n ce that estroge s ha e on th prostat c er
✓ Th pro tatic tumor m y co tin e s m tasta iz
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Jou A L M D

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Th s arti l descr bes the un su lly eve type of
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J u A L M D

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Of the 73 wh t pat ents 131 were h p tal l
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From th p c c ted th authors co d d
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S tul ky E M Ma gement of Ch ncr l d l
T opical Theat r Report of 1555 Case J
Am M t 945 7 59

Ch ncr d an acute flammatory lestru ct
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The el disea r te n th last was 86 6
per ooo o p c nt f all h p tal adm o
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m e read ases I r t month th r
al m f c t o rat n the Army has bee b l pea e
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re l disea

Th port d l th 555 pat ts in h m the
d n s f cha c l mad The v rag cu

b tion per d w s from thee to ten days after se ual e posu The nit al l on was a sm ll r d mac le h h b came papula pu tular and fin lly sulcerat v Mult ple l ons ere ab ut f r time as c mmo as s gle lesions Only 62 of the cases wer in c l d old ers Clin cally the les o s ere ragged irre ular sl htly ndu ated ulc rs co ered with a yell g ay purulent pellicle hich could be wped away r v aling a n c tic gra ular base wh ch ble l eas ly A redd ned inflammatory ar la w s usu lly p se t The ul rs sp ead by tens n a d c al see c d w bs rved to b inoculabl and a t in culabl Ingu al lymphadenopathy was observed in 56 per ce t of the cases Usually the nod s we e frm elast c and movable b t in som cas s they er m tted t ether and fluctuant The diag s s f ha c o l made on cl cal grou ds alo after l b ratio y tests for syphil s (d l feld) and lymph a l ma (Fr i k n test) were fo nd gative Cult r s and immunolog cal and d f e t l st n t ch que e not empl yed for diag nosis

Tre tme t con tel of local r system c and local Im nistrat n f sulf mides When g ve locally th lesion s cle nsed vith s ap and w ter tw ce daly du t d th po dered s lfa ilam de and bandage l loo ely until the lesion healed In patients

with phimo s and l lya g ulcerat e lesions irri g t s e e g ve t ice d ily vith r to 5 000 potas um p manga at s lut After adequate trial f the apy it as n ces ry to make a d rsal sl t in 6 p tients vith vere p l m which int rf red ith dra age a d th apy When suppurat ve in al glands were present they w re aspir ated th ough a st r le ca ul a d inj ct d with from r o t 1 5 ml of 7 per cent t ctu of iod n and ba daged tght ly In f m five to seven days the area s healed with ut seq lae

Oral system c therapy consisted of sulf th azole gm four t mes daly fo fve days followed by 5 gm f ur times daly for ten days Sulfan lam le was also used as as sulfad z ne but the best re lts and f wer toxic reactions were obtained ith sulf th azole All lesions h aled without surgical ntervent n a d p tie ts were d scharged to full duty vhen the lesions were completely p thel ze l The verag hosp tal zation pe to l was eleven and two-tenths days From three to fve d y after dis ch rge from the h spital 55 pat e ts develop d currence of th r pe le lesions In 18 f these d l field e am ations w e pos tive The r mai n case f chaner d responded sat fact rily to fu ther local and system c sulfo amide th apy

DON LD F McDONALD M D

SURGERY OF THE BONES JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Coope G E Epi ndylitis f the H m ru U S
M Bull 945 44 5

Epi condylitis is a painful p riste t f f ct on of
th perio tum a d t n no t tachment f the
xte nlate al o nter al (m d a) hum l
ep condyl Its pathogenes s obsc and th
c nditi n tends to e e tual rec ery The c dton
affects th xte n l p condyl t n o t l e times a
fr que tly as it does the i t rual Th r a o f
this may b that the e ter lep co dyl s mo
oft n expo ed to i j r y th s the t alo e In
a ry f w sta ces both co dyles m y be affected
multa co sly u lly foll w ng a cru h g in j ry
T o cases ill st t g the typ cal f dngs n e t
lep co dyl tis are p esent d

Th tw m st characterist gn f e t al p
co dyl tis re te de ess ov r th e te al ep con
dyle and p i on d rsil tion f th w ist ag st
r s tance

The tvo cha acte i t csg of i te lepicondyl
t re t n de ess ver the m d lep ndyl a d
p n o p lma fl i n of the wrist ag n tress i ta ce
Treatment is carried o t while th p tent co
ti ues h s work Y y th rapy i probably the
t e m t of ch ce w th ope to res rved fo th
tant cases

X y th rapy dmi ster d i four doses of ab t
5 roe tge s each t four day i te al s eff cti
i a fa ly h i p e tag f cases How ver t s
som times follo ed by a tempo ary te s ficat
f the ympt ms a d its effect can o b pp ec at d
u til sev ral eeks ha e passed I o of the cases
repo t d h re it a sed with e cellent res lts t is
r b rd as th t atm nt of ho ce

Ope to c i t s f care f l s e ch for a radio-
humeral b rsa a th tomy of th adi h me l
j nt th m v l of th hypertroph d synovi l
f g e f pres t a d t pp ng of the t d n
f m th p o dle wh ch then caut zed No
ttempt made to ut re the t nd b k n pl
The o d s c led and th lbo s d e s ed th a
m press o d cs g

R S P Mo T G MERY M D

W n H S Cal ificat n f th Int r v t bral
Di cs in Child hood J P d t S L u 945
6 78

Th t log c l f tors d cl cal ifica f
calcif c t n of i t rve tebr l d s es n adults h e
b n th byect of tro rsv Interv t b al d cs
consist f three p ts th n cl u p lpo a t
fibros d ca tilag plates C lificat on of int
e teb l d cs ad lts may ca se agu compla ts
or may o c r with compl te abse ce of cl cal
sy mptoms

Th a th r r p r t d th case of a five y old
gil h de l p d a sudd attack of rep i n
the b ck of th h a s cuated ith h peret n
f the c rical p k phos s of the tho acc p
a d marked limit u f m tion f the h e d nd
eck The acute eps d as p eceded by light
ch g the b ck of th ck fo twom th Th
p e s h s t ry e e l d fr quent tacks f t
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leuc cytos i w th i phla we e ted Th ex ra
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th cleu p lposus d th ant r port n f th
an i s s u b o s f the s th cervical d c Thi i
c fcat h d b p es tfo all ast seven m th
as dem strat d ap us chest r ent g ram
W th o t treatm t compl t eco ry foll d ith
i t e l e d a v X ray am nt afte th i t
v l r e led t k g d cre e the s e of th
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afte f u months sho d complete d appe a ce f
the calc ific o

F add to l sta cs f c l ficat i of i te
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ch l d r ewed f om the i t rat e All ca s
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cificatio of i t rve teb l d cs i hld ho d a d i
ad l l f e

I l me t of the c rical p a n t l i
4 f f 6 cases of calcificat of nt rve t b l d cs
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2 Rapid ch g i th size of cal f cati
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Calcificat n f the n cl p l p dult l f i
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s p b bly of l ttle cl n cal g fica ce i ad l l f e
Th demo t t i of a b l l pply to th i ter
rt b al d cs hld h l suggest th t alc f
to mav be th res l t f a m tast t c f c t
pr es i l g the d cs

E t F Ar m M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

H m n O J Th M M rray O t t my f r
N nunt d H p Fra t s X J p l d J W
945 3 86

Th M c M r r y o s t t m a b l c t per
t b ed th suggest f Lo wh h th
shaft f th f m s t f red d tly d r the

l er m gin f th acetabulum and heal f the fem r The chi f f u j o s e f th o t i i t ch ange l i g f r e s t o a l r c t o

Since the publication of a j e r j r i s i s p t m b r 1911 m e s u c h r e c n t u c t i o n h a c b n d o n e a t t h b o s t n c y l l p i l b y v a r i s s r g s T w o m o d i f i c a t i o n s i n t h e t e c h n i q u e v e c d d e d F i r s t t p l a c t h o s t t m y l m o r e a c c u a t e l y a K i s c h n e i e s i s s e t e d i n t h e p r o p o s e d s t t m y l a n d i t s p o s i t i o n i s c h e c k e d b y x r a y s t h e w i e t h n b g u s d a s a g u i d e i n d o i g t h a c t u a l o t e t m y S e c o d i n s e v e r a l c a s e s t h e B l o u t b l a d e p l a t e h a s b e e n u s e d a s a m e a n s o f i t r a l f x a t o n a f t e r t h e o s t t m y h a s b n d T h e f i r s t m l i c a t i o n s e d t o p l a c e t h e o t e o t o m m u c h m o c c e t l v t h a n t h e o d n y t o u c h m e t h o d a n d t h e e c o n l a s a d f i t m p r v e m t t h a t i t a s p o s s i b l e t o d a y t h t h p o l g e d p l t r f l i s p c a f t i o n a n d b e d c o n f i n e m e n t a n d i t a l s o p e n t e d t h e c u t e n d o f t h e d t l f m o a l s h a f t f r m l p p g o r s l d g t

F o f t h e 8 c a s r e p t e d i 94 h e b e e n e m i e d I a l l f t h e m t h e 1911 e n d e u l t s h a d b e e n d e e m e d s u c c e s s f u l T w o p a t i e n t s h a v e d e v e l o p e d c o n s i d e r a b l e p a i n h a v l o s t s m e o f t h e r l o c a l r a g e o f h p m t o n a n d h o w n i n c r e s i n s h o r t e g b c a u s e f s m e c h a n g e i n p o s i t i o n o f t h e d i s t a l f e m o a l s h a f t d e t l a c k o f t r u e b o n y u n i o n T h u s t h e 1911 r a t i n g o f t h e M c M u r r a y o s t o m y h a s h a d t o b e c e d o w n w a r d

O f t h e l a s t 11 p a t i e n t s t r a t d d d s a f t t h o p e r a t i o n o n e t h m t h e e d s f t r w d f o m c e b r a l t h r o m b o s a d t h e o t h e r w i t h i n t w e n t y f h o u r s f r o m c a r d a c f l e

T h o s e w h o c o m t a g o d c l i n i c l e n d e s u l t f l l i g t h s m t h o d (n e c a n e p e c t a b o u t 80 p e r c e n t o d s) w l k t h a s l i g h t i m p b e c a u s e f t h e r e s u l t a n t s h o r t g f f o m 2 t o 3 c m T h y d t h e i d a i l y a m o u t f r t i e a l k g a n d g u p a d d n s t a r s w t h u t p a n b t w i t h a c a e S o m e h a v e m d a t e p a n t a t t h e d o f d a y a f t r a e x t r a l g w l k T h e y c a n s t a d l w i t h c o m f r t a l t h g h m e c a e t h e r e s a f l i g o f l c a l s t i f f s s

g e t t g p f e r a p r t r a t d i s s i t i n g w h c h w v r p a s s e s f i n m o v i n g a b t A s a r u l e t h y c a p t n t h r s h o e a d t o c k g t h f f e c t d l g b e c a u s e t h e y c a n f l x t h h i p c o t h k e e a n d a d d u c t a d e t n l y r o t a t t h l g I t i s t r u e t h a t t h e c r o s s g f t h l e g s i s f t e d e w i t h s m e d i c u l t y b u t t h e s p i n T h p a t i n t s c a n b t h e m e l e s t h r l g s q i t w e l l b c e o f t h p s e c e o f a n a b d c t i n a r g g b e t n s a d 35 d e g e e f o m a l c a l a t m c t a d p o t t h e p e c t u r s t c o u r a g e n d a l l t h t a c a b d i t h a t t h f o m h e a r g o f c e o f t h f m r h b n t a n s p o s e d i t a d r t f c e t h t e l m t s p i n d g s f l e c t t b i l t y n d m b i l t y a t t h e h p j t t e n b l e t h p a t t o g b o u t g o o d d g r f f u t i g c o m f t i t h t h d o f a c a n

T h e l e c a e s i n w h c h t h B l o u n t b l a d p l a t n t r l f a t a s s e d f l o w g t h e o s t t m f m h a d d a t l d a t a T h t e c h n i c a l p t o f t h

f t i c u l d b e m d e m c h s i m p l r a n l t h e p l a t m a d t c i f r m m t e a c c u a t e r t o t h a n g u l t h p e n c l i f a t o p i e c e c o m l t n h a s t h e T h r t n p l a t e t g e t h e r v t h t h S m t h l e t e r s n i l v a s i e d T h s f x a t o n d o e s a w v i t h p o t o p e r a t i v e f i c a f i a t i o n a d t h e r e b y a l l v s m c h l i e r m b i l i t y f t h v a r i o u s j o i n t s i n v o l v e d t h e s p c a f i x a t i o n a n d o f c o u r s e m u c h e a r l i e r a p p l a c a t i o n o f l o c a l p h y s c a l t h e r a p y I t s h o r t e n s t h e p e i d o f c o n f i n e m e n t t o b e d y f r o m f i v e t o e l e v e n w e k s T h e f a l a d a t a g o f t h i s f i x a t o n i t a t i t p r e v e n t t h e s l i p p i n g o s l i d i n g o f t h e t r a n s p o s e d f m o r a l s h a f t f r m i t s m o o r i n g s

T h e M c M u r r a y o s t e o t o m y i s n o t s o s i m p l e a d n o n h o c k p r o d u c i n g a s o g a l l y t h o g h t

T h e c a s c h o s n f r r t h e o p e r a t i o n s h u l d b e e l c t e d c a c f l y f o m a l o c a l a d g e e l s t a n d p o t T h e m u s t b a f f i r l y i b l e h e a d a n d s o m e f e m o a l c k a d t h e p a t i e n t m u s t b a g o o d s u r g i c a l r i s k

T h e p a t i e n t s s h o u l d r e c e i v e d e f n t e v e l l g u i d e d p o p e r a t v a d p o p e r a t v p h y c a l t h e r a p y a n d g e n e r a l s p p o t v m e d c a t i o n a n d n u t r t o a o u t l d b y t h e m d c a l c o n s u l t a t A s t h p s t p e a t i v e p e r o d g o e s i n t o t h e t h i d y e a r o f m o e t h e r e m a y b e a r e t u r n o f h i p p a n b c a u s e o f l c l c h a n g e s i n p o s i t i o n o r b o n y c h a n g e A g o o d e n d r e s l t b y t h s m e t h d g i v e s a p a i n l e s s f u n c t i o n g h p h i c h e n b l e s t h e p a t i e n t t o s t w l k a d d e s w i t h c o m f t T h m e a n a g r a d e a l t o t h e p a t i t v h o p e i o s t o t h e p e r a t w h a i g p e r t e n t l o c a l h p p a i n a d w a s c n f i n e d t a b e d o r h l c h o r c o m p l l e d t o u e c r u t c h e s T h e M c M u r r a y a t o n f r t h e e c n s t r u c t i o n o f p a i l i n o n u s t e d h p a l t h u g h a p p a r e n t l y m o e g e r a l l y a d a p t a b l e t h a n o t h e r m e t h d s o f e a s i e c u t a t i o n a d p r b l y g i g a h g h p e r c t g e f p m l e s l y f u n c t i o n i n g h p s s h o l d n t b e u n i v e r s a l l d i n s u c h c a e s N o w a s a l w a t h s r g e e p n e n c e d i n s c h p r c e d u r e s i l l c h s t h o n e h c o i d e r s i n e s t a d p t e d t o t h e c a s i n h a d

R O B E R T P M O R R O W M D

FRACTURES AND DISLOCATIONS

B n t l y F H T h m n S B i n g h m A K K y J A d W o t e n l i m M H T r e a t m t f C o m p o d F r a t u s b y E a l v W u d S t u a n d l e n i l l n L / L d 945 48 3

T h e a g u m s t h a t c o m m e n d e a l v r e p a o f f l e s h w o d a p p l y w i t h e v n g r e t r f o c e t e a l v c n e r s n o f o p e n f a c t r t o a c l e d o n

T h e r e s l t s f t h i s p c d u r e e s s a t s f a t o r y t h o s e i n u n c m p l c a t e d f l e s h w o n d s a n d t h s r e p o t d e c r e b e s t f i r s t 62 c a s e s t r e d A l l o f t h p a t i e n t s r e c e i v d p e n c i l l n l c a l l y i n t t h e w n d L a t e r i n t h r e a m o r p n c i l l n w a a a l b l o m r e c e i v d a p a n t a l c o r e a c e l l a l t h g h w i t h t b v i o u s d i f f e r n c e i n t h e r e s u l t O f t h 62 f c t e s t a t a d 58 p e r c e n t d f m a r y h i n g f t h o f t e s e s a n d 2 h a l d f p r m v l f f o r g n b o l y l l f t h e s 60 j o c l d t n m a l b n n T w o e s u l t d i n f a i l r

Burns B II and Young R H Comp und Frac
tur of the Fem Trated w th th Aid f
P n icillin La 1 L d 945 48 36

When a débr dement h s b e n d n e s o m e d y s
p r e v i u s l y t h e u s e f p e n c i l l i n m a k t p o s s i b l e t o
s e w u p i n f c t e d a d p u r u l e n t v o n d a n d t o
c o u r a g e a c t i v e m o v e m e n t n o t n l y w t h o u t d a g r
t t h p a t i e n t b t w t h p o s i t i e b e f i t t o t h e l i m b

These methods we o c c s i o n a l l y u s e d b e f o r e
p e c i l l i n w a s a v a i l a b l b t n o w t h e y c a b e e d
t h g r e a t e s u c c s a n d s a f e t y F o m r l y i t a s t h e
d g e r o f s p e a d i n g s e p s i s t h a t w a s f e a d b u t n o
w i t h p e n c i l l i n e h v e t h a s s u r e n e t h t a s s o
a s t p t o c o c c i s t a p h y l o c c i a d a n a r b i c b a c i l l
e t e r t h e b l o o d o r l y m p h s t a m t h e y a e d e s t r o y e d

A p o s s i b l e r e a s n f o t h e l c k o f e n t h u s a s m s h o w n
b y s m e s u r g e o n s f r t h e u s e o f p e c i l l i n f r a c t u r e
o f t h f m u r m a y b t h a t w t h t h e c e p t o n o f t h e
i n j e c t i o n s t h e y h a v e t a t e d t h e i r c a s s i n t h e o c
t o n a l m a n T h e s k n h a s n o t b e n s t u r e d

a s a r l y a s p o s s i b l e n o r h e e a r l y m o v m n t s b e n
n o a g e d C e r t a l y p e c i l l i n d n n o t h a v e s
d r a m t c a n e f f c t o n l c a l s e p s s t d e s t h
p r e e n t i o o f t h s p r e d b u t t h a t p r e v t n s a b
s l t F o r i s t a c t h e e r e n d e t h s n a m
p t a t n s a n d n p t c e m a i n t h a u t h o r s s e
a n d t s o t e w t h y t h a t F u l g n d C l a r k (9 4 4)

w h s m n t h w h o l n t t o h a v e b e r y f a o r
a b l y i m p s e d b y t h e e f f c t o f p e n i c i l l i n t h s
c a s h o h a d n o d a t h s f o m s p a n d n a m p t a
t s f o r s p s i n t h i r s i s o f 7 c n p d f c
t s t r e a t e d i t h p c i l l i w h e e t h 7 0 c
t l t h e r e 3 d a t h s a d 4 a m p u t a t n d u e t
s p s

N e r l y a l l t h e p t e n t s h a d h d m e p c i l l
b f o r e a r r i l b u t t h d o s e s t r a n s t v l t h
d e l i m i t s b t h a t d o s g a d n u m b r o f j c
t s O n a l t h y e r e i m m e d i a t l y s t d n
a f i d y c u r s e o f o o u t s g e t r a m s c u
l a l y e v e r y t h r e e h u r s

M y o f t h e p t t s a n d w t h t m p t u
f a b t o o f d p u l s e r a t e f f m o o t
p e r m u t e T h t m p e r t m t f t h m s u b
d e d a w e e k f t s u t u r e S m e t i m s t h p c i l l n
m i t t d b f e t h e t m p c t h a d t t l d
T h t e m p e a t e w a s n t t h o u g h t b l b l
g u d e f r p e c i l l n s m e t i m e n t l f t h c
f p y r e a B e t t d e c e o f t h p t n t p r o g
c l d b e o b t a d f m i n p c t n f t h l c a l d
g l c o d t s a d f t h h a b l l f a
w e e k o r s o b y n t m a t n o f t h h m g l b

The suture g w a t d e t e r m d b a c t l g
c a l f i d g s b u t n a a t o m l g d s l I t
w s b e l i e v e d t h t o n l y t r p t c e d t a p h y l
o c w l d b l l y t t r t h b l o o d a d t h y
w l d t h e r e b e d t r y d t h g h t a c t f i l l
p e l l T h e t r s f d t h t t h p c i l l
t i c m i c r o b e s h a t d c y t g t
p t m a s p d g p I t p b l t h t
t h f i t m i s l o c a l a d t h a t t h y t l a g l y
s r p h y t e s I f t h w d t l t h y h
n o p b l t q u e t l y d o f f

A s a b a s a l w a y s t a k n a t t h t i m e o f t h e f i r s t
i n s p e c t i o O l y 1 2 v u n d s n t h e 7 0 c a s e s w
t h e s t r e p t o c o c c u a n l s t a p h y l o c o c c u a u r e u s f o u n d
o n c u l t u r e M a n y o u n d h w e c h a r b o r e d t h e
c o l i f m b a c i l l s a n i s m e t h e b l u s p r o t e u A
f h r o b o r e d g a s o g a n i s m s a n d t h e p s e u d o m n a s
p y o c y a n e a T h s t r e p t o c o c c i a n d s t a p h y l o c o c c i h a d
b e e n k i l l e d b y t h e p n i c i l l a n d a n y p u s w a s d e
t o g r a m n e g a t i v o r g a s m s a d w a s o n l y m i l d l y
n i o u s

D r a i a g e i n t d s i r a b l e n t h e s e c a s e s I t i s
p o b a b l y b e t t e r t o c l u d e g r a m n e g a t i v o r g a n i s m s
t h a n b y l e a v i g t h o u n d o p e n t o a l l o v a c c e s t
s t p t o c o c c i a d s t a p h y l o c o c c i w h c h i l l g r o w a f t e r
c e s s a t o n o f t h p e c i l l i n p a r t i c u l a r l y i f a t h i c k
l a y e r o f g r a n l a t i o n t i s s u e h a s f r m e d a b a r r t
s y s t e m i c p e i c i l l n W i t h a y s o r t o f d r a i a g e t h e
i s t h e p o s s i b i l t y o f t w o a y t f i c E v e n p e c i l l n
t u b e s s e e m t o d m o r e h a r m t h a n g o o d a s a s i n u s
o f t e d e v e l p e d b u t a s a r u l e t h s h e a l e d i n a k
o r t w o T h s r e a s o n t s u p p o s e t h i t w o u l d n o t
h a v e o c c u r r e d i f t h t u b e h a d n t b e e n i n s e r t d I n
s t a n c e s i n w h i c h a p n i c i l l i n t b e a s i n s e r t e d
g m p o s i t e c c i r e a p p e a r d a f t e r t h e r e m o v a l f
t h e t u b e

W i t h o r w i t h o t d r a a g e t h e r e a s o s t a n c e
f s p r e l g s e p s i s I t a s n t n e c e s s a r y t o o p n
a b s c e s s n a y t h e r p r t o f t h t h g h t h a n t h e
o g a l w o d i n a c t l y i n a c o m p l e t e l y s t d
c a s e s w a s t n c s r y t o o p e n t h e w o u n d T h
w a s n o c e l l u l i t i s l y m p h n g t s e p t i c e m i a

L o c u l a t n o f p u s d i d n o t o c c u r i n n y c a e c m
p l e t e l y s t e d

S u t u r e o n p a r t i a l s u t u r e b y b l i t e r a t i n g t h e
d d s p a c e p v n t s a p c k e t a d e c n w h e n t h e
w o d i s n o t s t d o v m e t f t h k n p o
d c e a p u m p i n g c t o f l q a d i e p a n d t h e b y
l i m i t t h e s e o f t h p o c k e t b y e m p t y i n g t h e e r y
t m e t h m u s c l e c o n t r a c t s I n n o i s t a n c e a
p o s t e r i c t e r i c i s i o n n e c e s s a r y w a s i t
a c c e s s r y t b t a d e j e n d e t d a a g b y p p l y
a s p c a d t r n g t h e p a t t h i s f a c e

O n l y 4 o f t h 4 8 c m p l t l y t u r e d c a s s h a d a
s i n u s t h r m o t h s w h l g f t h e 2 2 i c o m p l e t e l y
c l o d c a s s p r e s e d s u s

U f t h s e c m p d f r a c t u r s p r o c e e d s a
q c k l y a s o r e v e m q c k l y t h i n c l o s e d f r a c
t r s I t m a y b e t h a t t h h y p e m c a u s e d b y t h e
c n t r l l e d i n f e c t i o p l a y s i t p a t

I t i s e x t r e m e l y u d r a b l e a d a l s o q u i t e u
n e c e s s r y t m o b o n e f g m e t s u n l e s s s
o c a l l y h p p e s t h e y a w i d l y d i s t l a c d
L f t h e y e s t p p d o f p r i o s t m t h f g
m t s b e c m e v a s c l a r i z d n d c o r p o r a t e d i n
t h e b o n e I t i s r e m a r k a b l e h a m x t u r e f m a l l
b o e f r a g m e t s n d p c e s f m e t a l g r o w s t g t h r
t f m e w h f t

I 6 2 c a s e s t h e r a g t m e f u n j u d g d f o m
t l e t m f d s c a d o f a l l s p l t g w a s t h t n
k s W g h t b i n g s l l w j a b u t t w o
k a l t e r I n 5 c a s e s a g f t t r e i f c e a s l e d
b r d g e f b o n e w i l l b n e c e s s a r y T w o c a s s i l l n o t

ti ts wh died Po ti e blood cultures were ob
tained p ope rat ely in 8 f the 97 ca es in whi h
blood wa taken i 36 of th 80 ca es ne or mo
pos tive blood cultures we e obta ned postopera
tively The great t exp s n of the pathol g cal
p cees w s in o ab ut th bulb of the int mal
jugular en a d n o cases th e actu lly as p
w thin th bulb S ty thr e pat ents h d e o
mo e ch lls p ope atively nd 32 had onc o m re
h lls po t perat ely

The tim at which a metastat c focu b comes
cli cally evident is no r i able i d focu as to
hen th bacte a ere depo ited Changes the
cular f d were observ d before op ation 24
patient whereas they we noted postoperat ly
38 patients Evaluat n of the material i d cat d
that it as not possible to correlate co s ste lly th
ppea anc of the funi nd the gen l co d t on
f the pat ent at ny gi ent me Occa nally the
hanges in the fundi progress d ev n aft r th pa
ti t was e lfe ough to b ut of b d i here
th r i stances d fi te imp o cement n the fu d
as n ted desp te the fact th t th pat nt was still
gravely ill

There were 27 deaths in this gr p of 100 un
select d p tents All pat e t operat d on e e
clud ed desp te the p ese ce of absce f the bra n
a d mer i tis in a numb r of th m on adm s

The mortality f m th thrombophlebit as
much hi he in patients o r thirty y ars f g
than in child en a d you g adults N i te pa
tents wer t at d by operation c mb ed with
chem th apy 7 eco e d nd 2 d d Th i
fluenc of chemotherapy in the t eatment of b
teri em a s great and becau e of th s one mu t b
ware of the tendency to await the fi t of chemo
therapy lone in ca es n which th l te al s us
volv d Unt l substa tal vide ce t th c
tra y i advanced o e s j st fied in as um n that
bact ri m a due t thrombophlebit of th l t ral
s u will o mav pers t d p te chemotherapy i
that u cal mea ues so th rad cat on f the
phlch ti proce a arra ted Th atme t g n
erally employed th s e s co s t ed of obl t a
tion of th lateral nus a d i at on f the i t r m l
jugul v in N A H D FABRI A T M D

And II P O Th mb of th Int mal C r tid
Art ry A i m d d 943 4 336

Th mb is f th nt mal car t d rt ry s ra ly
d gn ed du i glf Th l cal symptom h w
v r ar rathe h acter st c nd th d agn is can
al y s b c firm d by art i graphy Th l t ra
t re h w s 23 ca s th t ha e b e d gn d by
a t ographic c m n t on a d the thor ep rts
9 case f h s own dag o d the m ay De
t l d ca h st es of th a e g

Th b g i sympt m g nerally h ad h
th m de a th th ombos i at ry Th m y
cc r j rs bef e th b g n g f th thymp
tom The e a ft n i ych c sympt m h as
em t o louth rts irat blt i nf Th

first m led neurological ymptom s g nerally h m
pa sis m t freque tly i th arm f th begi
ni g the p res may be lght a d tra t ry All
f the pati nts i th s ies sh ed fa al pares
and 3 cas th e as d fi t hem nesth a
Aph a ge rally beg s ft r th d vel pment f
hem pares s Amo g th mpt ms that sem t mes
ccu pare th s a a d p s the h t lat cal
t emitu p l pti izu s hyper and hype th
s i n the g f the t facial nerve a d tran e
vi al d st b nces The p tents are g n rall y
good g neral h lth b f th g s of th art ryal
les on beg n I 3 f the 6 cases i h ch en
ph log aph am at ns ve e made th re as
v den g f th lateral ent icle on the same l
as the arterial l s on

It pr babl that i the maj ity f c arte
scl s s causes th omb s f the t al c t i
art ry The ch f b j t f t eatm t i t p nt
ce ebral les s by k e p up n a d q t blood
s pply to the bra The c eb les s prob
ably d t pasm of the c ebral t r bro sh
about by th d mag i ca tid a t ry Th r f
e s f th d m g d s t o f the artery m
to be i d cat d som cases Th w perf m l
i of th auth r ca s b t w th t v ry g at
eff ct To b eff ct i e th opt ti should b p r
f rmed at th ea l est po bl st f th d s e

A B G M O M D

V al J R nd II y H H S g ry f De p
V us Thrombosi of th Lowe E t mity
S gery 945 7 8

If thromb of o f the p ph l e i
v lps a att mpt i m de to l m t p p gat n f
the th omb t p e t p l m n y emb lu d
t e rrect y l c i e cul tory mp rm t Th
m thod ft atme t rv ith th type of th m
b a d th p e r ab nce f p l m a
mb l m S the nly p e cal m thod ft t
m nt in th m j ty f cases l gat f th
app pr te i ab v th le l f the th mbos
th uthors p r th pe ces n 98 m j ve
l g t n s me 84 sec t e es of d p
th ombos the l e v t rem t es

Th uth rs clas fy e o th mboses r cut
th omb phlebit s w th a t c d t r c m ta t
fl m m t of th ll a d st te th t phl bo
th ombos (mple th mbosi) h a t i d by
th b ce f acut i fl mmat ry re c nea ly
th t nde cyt p p gat ap dly d th ea th
h h th c t b e om d lodged t ca ep lmo y
mbol sm

In d s c s g th p d posi g f ctors i
th mbos th uth rs e port th t 55 f th ca es
e i m les d 29 i fem les a d also th t 7 pe
t of th ca es wer in p t ts e f t y e r
f g Of th 84 ca es i th e es f l l d
g cal i oc i es (5 pe t n the abd r m
3 th pad p at n pe t f br nt m
i f l mba ymp thect my) Tw ty
ca es f d p thrombos wh ch o cu red spo ta

ly in i d v i d a l s i u r s g t h i d l v o t
Twel ca es arose car l i c i a t e n t s h m
a c t h e t f i l r v e n t i p r l o n g e d l d
r e s t u o f s d a t e s a d p o s s i b l y l i g a t o n m a y
h a v e b e e n i m p o r t a n t f a c t o r s T w e l t h e p a t i t s
d e l i p e d t h r o m b o s s e c o d a r l y t o d i s a s e o r i
j u y i f t h e l o w e r e t m t y (6 c a s s f r a m a 3 f
c l l u l i t i s 2 o f g a n g r e n e a d i o f a t h r i t s) T h
t h o r s a l s o h d 8 c a s e s i n p t n t s i t h p l m o n a r y
t b c u l o s i s h o w n a r e g i m e f i s t r i c t b e d t
a d s p a t i c t s i l l i t h p u m o n i a T h e c h i e f f c
t o i n a l l t h e s e c a e s a p p r e d t o b p o l o n g l i d
s t e c e p t i n g t h p r e d i p o s i g f a t r s s u c h a s
b t y m a i f e c t o a n d n e o p l a s m

l 6 i o f t h 8 4 c a e t h f r s t s y m p t o m a s j a i n
i 6 t v a p u l m o n a y e m b l s a n d i n 7 i t a
s w e l l g e t t h e c a l f T h e m o t e m m n s g a s c l f
t d e s e h c h s f u n d i n 7 8 f 8 p t i c t
x a m i e d f r i t H m a n s s i g n w a p o s i t i e 6 8
a e s T h r e w e l y 6 c a s e s w h e t h t e t s
g a t e l v e n d t h y c a d a s c t h e y f e
q u t l y c o l l i b e a c c o n t e i f b y t h e p m a r y d
s w e c n t v r y h e l p f u l d i a g n o s t i c g s v o
g a m e r e m a d 2 7 o f t h 8 4 c a e s a n d e e t
c m m e l e d t l y b e c a u s e o f t h e d i f f i c u l t y
t e r p e t t i f t h r m a l s T h a u t h r s b e l i e e
t h a t t h e s e g m f a l u t h d a g n o s i o f
l u b f u l c a s e

I n 1 6 o f t h 8 4 c a e s i u l m a y e m b l s m a t h
t a l s y m p t o m l i n 3 a d d i t a l c a s e s p u l
m a r y e m b l i m e c c r e i b f s g c a l l g t
T h a u t h r n t d n c r e a s e i t h e m b e f i l
m a r y m l h t h i n c e i g g e T h e t l i e
t h t p u l m o n a y e m b o l m i s a p o t e t i a l d a n g n
r y c a e o f e n o t h r o m b o i a r d t h a t t h r n o
s a f e r i o d i n a n y f t h e c a e s i t h f i r s t f u
m o n t h o f t h d e c a e T h e y a l s o s t a t t h a t t h l
a p i c t u r e o f c a s e i u n f a b l f o r d e t m n g t h
l k l h o o d o f j l m n a y m b o l u s O f t t h m b u
i n t h e i l i c i n o t f i x e d t h e t m a d
r e p e a t e d p l m y e m b o l m c o m m t h e s
c a e s o m e t i m f o d v o r e l s

P l m n y e m b o l m o c c u r r g a f t r i g t f a
m a j e n m a y i g n a t f r o m r a l s u r c e t h
m o s t f r q e t f w h i c h i a t h r o m b s s t h v
o f t h o t h e r a t m t y I t a l o m a y r i g n a t e f r m a
t h o m b u i n t h l g t e d e n b o e t h l l o f t h
l g t f m o t h r e s i t h e b o d y o f o m
t h r o m b n t h i g h t d e f t h e a t I n o o f t h 8 4
c a e s t h p a t t s b d p l m r y m b l f t e l g
t o o f o n e o r m r e c i b t n r y c a s e t h e
h a d b e e n o n e m r e j i o d e s o f p u l m a r y m b
l m b f r e l g t i o I 5 i t e s t h m b o l a r
f m t h p p o s e u o p e r a t e d e t e m t y a n d i n 4
c a e s f r m f e s h t h o m b u s a b o e t h p o i t o f l i g
t n T h r i f t h p l m n r y m b o l l d t f i l
u t o m e

T h e r e 9 8 c o n c u t i p e t o n o n t h e s 8 4
c e s (3 5 e o t h e g h t l e g l o 3 3 o t h l e f t
a i 6 n b o t h l g s) A l l g a t n s w h e r d
b e f r o p e g f t h e c f i p e c t n w e r m a d
a b o a l l c l w t h e p e n g t h y w l l m i

f t h f m l r h g h e r a n d d g 2 9 o n t h e
l a c i n s a d 6 o t h i n f r i r v e n a c a T h
t h r s c a l l a t t e t n t o t h f a c t t h e f i f t h
o f t h r j t i e t s h a d v e n o u t h m b s i s i n b o t h e
t e m i t e s

T h e r l e t b e f o l l o l i n l g t i n i g a t e t h e
a f f e c t d v e i n b t h l e o f t h t h o m b s n a
n o r m a l s e g m e n t j u t d i s t a l t o a m a i t r i b u t o r y a n d
a v d a b l i d d i i w h i c h a t h r o m b u s m a y f
T h e c g e a t d g r f a e c u r e n t t h r m b o s
w h e n l i g t p e r f o r m e d t h u g h a d i s e a s e d s e g m
t f a c i e e t h o u g h t h e c l o t m a y h a v e b e e n
r e m o d e r m a n o t h a e e x t e n d e d t o t h i s l e v e l o f
t h e v e i n

T h r m b e c t o m y c a n b e d o n w i t h o u t d a n g e r p r o
v i d e d t h e c l t s f r s h a n d u n a t t c h e d t o t h e i n t i m
a n d t h e v e i n l l s f r o f n f l a m m a t o I f t h e c l t
i s l d t h r o m b e c t o m y t o o d n g e o s b e c a u s e o f t h e
l k l h o d f d s l d g i g f r a g m e t s o f t h e c l t

I n c a s e s f p l m o y e m b l i s m f r m v e u s
t h r o m b o s i e v e n t h e h o j l e l y l l p a t i e n t i c a n
d i d t o f r v e n l g a t o N e o f t h e p a t i t s d d
f r o m t h e o p e r a t i o n I f o n p e n i g a v e i n t h e i n f l a m
m a t o r y p r o c e s s e e m s t o e x t e n d b y o d t h a t p n t
t h i c i n s h l d b e c l o s e d a d t h e v e i n l i g a t e d
h g h e r T h t e n a l i c v e i n w a s l i g a t e d n l y 6
t i m e s s e t h e p r o b l e m o f t h c l l e t a l c i c u l t i o n
m a k e s l i g a t e l e s s d e r a b l h e e A l l o p e r a t i o n s o
t h e l a c e d o e b y t h e t a p e r t o e a l r o u t
a l n a l m o t e y c a s e a d e q u a t e x p o s u e f o e
p l t n f t h e i n b f o r e l g t n w a s o b t a d
T h a t h r s e i a g r e m e n t w i t h t h e i d e a t h
b i l t e r a l i n j e c t n s h l d b e p e r f o r m e d m o r e f e
q u e n t l y

I n 4 5 c a s e s i n w h c h t h e e w a s n o p r e c e d i n g p u l
m o n a r y e m b o l s m p i o t o l g a t o n e d e v o l o p e d
f t e r o p e r a t i o n S i n c e t h e c h a c e s o f d e v e l o p g a n
e m b o l u a r d b u t n e i n t h r c i t h e t y p e o f t h r o m
b s s u d e r d e c u i o n t h s i s i g n i f i c a n t a c h v
m e t O f 3 9 p t i e n t s i t h p r e h g a n t e m b o l m o
h a d e m b l m f t e r l g a t i o n J 8 f t h e s c a s e s i t
w a t h r e s l t f a d e q u a t e s s i g n a t t r m t n
r a t h r t h a t h e f a u l t f t h e p r i n c i p l e f t h t r a t
m e n t

T h a t h r s a l o h a e t h m p e s s n t h a t f e r
l i g a t i o n t h e c i l s t e n d n c y o f t h e t h r o m b u s t o
e t e n d b l w t h e l v l f l g a t n a d t h r e f o r t h e
p t e n t v e s c h a n e l a r e l e f t a s a l a b l e f t h
c o l l t e r a l c r e l t i P a t n t s w h o h a e h a d t h
c o m m o n i l a c i n f r i o r v e n a c a l i g a t e d u u a l l y
d l p a m o r c o m p l e t e c i l l a r c i r c u l a t n t h a n
t h s h o m t h e x t e r n a l i l a c o f e m o r a l v e i
l g a t d

T h f u c t i n a l r e c r y o f t h e t e m t y a f t e r
l g t i o n i c e l l t T h e p a i q u i c k l y r l e v e d n d
v a s o p a s m s u l l y a b l s h d p o m p t l y T h d m a
w h c h s m t m e s t i m p o r a l l y i c r i a f t e r l g a
t n u u a l l s b e s a f t e r a f w d a y o f e t n d
l e t i o n f t h x e m t y T h e w r g o f a n l a s t c
t o c k g w h e n c t i t y i s r e s u m d i a d s e d a t l e a s t
t l d e m a l n g e r d c l p s a e s l f a c t u t y

R o r R. B i u o M D

in the latter the vessel wall which is encircled by the suture line and is somewhat strangulated. The direct contact of the flowing blood. The joint is leakproof in the presence of antiseptic treatment. The flow of blood through the other half of the vessel because of blood contact with the suture material is not a stimulus to thrombosis. It is noted when the blood clotting time is normal.

The method was proved by successful experimental work. It is shown that a 90 per cent. percentage of success in bridging defects of the small femoral arteries of dogs without the use of autologous grafts is possible.

As in the Carrel technique the performance of débridement and the use of sulfonamides greatly hasten the percentage of successful results. If we delay anastomosis in contaminated wounds secondary hemorrhage occurred only once following the nonsuture technique and this is a testimony for hours and days which no sulfonamide was used. An aneurysm either at the artery-vein junction or in the vein graft has never been observed in the nonsuture anastomosis.

To gain information as to whether the plastic vein will function adequately to prevent gangrene when used to bridge arterial defects the right hind leg of two dogs was amputated at the mid thigh level. After an interval of twenty-four hours the legs were reamputated the non-suture two tube technique as used in the vein grafts from a third and fourth animal were employed to bridge the defects in the femoral artery and vein. The amputated limbs were preserved in cracked corn for the twenty-four hour interval. The dogs were given sulfathiazole (1 gram twice daily by mouth) from the time of the first operation.

The survival of the legs in these two dogs depended solely on the function of the vein segments transplanted from the other dogs and in this case the experimental results are excellent. Heteroplastic vein grafts to bridge femoral artery defects in additional dogs have been used. The tomography indicated for twenty days (average) which showed no joint problems. The four dogs survived post-traumatic edema.

The procedure for vein grafts has been found adequate in the segments of veins. The mixture and kept in the refrigerator. The fresh vein grafts cut directly from the dog as heteroplastic grafts to bridge arterial defects and without the use of autocoagulants. A segment of human saphenous vein used to bridge defects in the dogs as a task perfectly satisfactory for the three weeks and the quickening of the recovery of the three weeks before it was used. As may be kept for a number of days in the refrigerator.

Report of the results of the experiments have indicated that within five to ten days grafts at hand completely functional may be obtained. The results of the experiments with the five minutes by the surgical procedure. The results of the experiments with the five minutes by the surgical procedure. The results of the experiments with the five minutes by the surgical procedure.



Fig. 1. Arterial graft. The day after operation. The graft is in place. The first part of the graft is in the middle of the artery.

necessary in the demonstration of these reasons a method of blood vessel anastomosis to be successful and practical for war use must be easily adaptable to the use of vein grafts and in any length. The nonsuture anastomosis fulfills this requirement and unlike a suture anastomosis a considerable proportion size between the graft and artery; no way complicates the technique and efficiency of the method. The majority of the wounded soldiers will have intact veins which are suitable for use as grafts such as the cephalic vein for anastomosis of the common to arteries and the external jugular great saphenous and femoral veins for the anastomosis of other arteries. These may be removed quickly (in from ten to thirty minutes) for use as transplant to bridge arterial defects.

Caution is presented the application of the method emphasized the need for (1) immediate control of hemorrhage (2) the time for shock (3) control of pain and vasospasm with papaverine hydrochloride (4) chemotherapy (penicillin is undoubtedly the preferable agent in these cases) (5) preservation of a lower temperature in the wounded extremity (6) position of limb (when at rest in transport the limb should be placed at rest in a position from 45 to 60 degrees below the heart level this elevates the venous pressure in the extremity just enough to draw what little blood may be available to collect for complete deoxygenation).

Irrigation of the distal vascular tree with saline solution containing penicillin and heparin wash out the natural thrombin from the damaged veins and places penicillin in adequate concentration in the

Th sec nd p tie t d g g a hyst rctomy sh w d th eff ct of h morrh ge nd p dly de veloping shock Ea ly in th course of e nts a ig nifica t decl ne in the int m cular p essur ma fested itself d p d d the appe ce of pe i phe al c rulatory fail e Al ss of 590 cc of plasm volume d 8 cc of tot l bl d l m was not compa ed by cli cal s g of hock Alth ough intramuscular pr ssu e w s b g n g to d op th ven pr ssor mech n sm had not f l d The maxim l d cl ne in i tramu cul pr ssure nd f l r f the venopressor mechan sm couc d d w th clin cal d ces f per phe l rulatory fa lure Thi cu ed despite a sto t n of 272 cc f th pl m v lume by the u c f a 500 cc whole bl d tran fu i n The estoration f 745 cc f the pl m volume by the u e f a 900 cc whole bl d tran f s i how er couc ded w th el ical mp ov m nt Ad cr ase f 200 cc of the plasm v lume n the first po t pe t e d y was p es nt with an d q ate p ripheral ci culation The v nop es r mech n sm was also ompe sated The cli cal p t re of p phe l c c latory fa lu e co ncid d with the f l of the v nop essor m ch n m r th r th n w th th l s f 590 cc of the plasm volume

The th d patient und went a right neph pery with minimal p stop rativ depression De p te l ss of 205 cc of plasma volume the cli cal c nd t on of the pat ent wa good and th re was no d nce of peripher l c rulatory fail e Intram s cular pr es ure remain d unch ged b fo e du i g and after the operat on The ven pre rm hani m did not f il

The e can be no doubt that much conf si ne i ts as to the caus of the condit ons fou d in th co rs of well dev lop d hock n the hum n being Fa l to study th se ond t ons in man hum elf la gly resp n ible Th re ems t be no do bt that th arly st phe menon n traumati c h ck nd g duet a educt on n th blood vol m b t th s ne d n t b th ase n ma

From th robe vati ns the authors conclude that a d ton n pla ma vol me ne d n t be ne ly cha ge no an nitiat g f ct r n s g cal h ck o sho k f llow g hemo h e nd sug cal ope ati n in the human b g that perph al cul t ry f lu e can be vid nt witho t a y d t n in pl sm vol me and th t e ta degree of dec in pl sm vol me can ist w th ut p d c g c l t ry f l It i als evident th t a d ct n i plasma lum will be f nd lat g cal hock

W dly gn nt f th true fact rs whi h ont of th n pt n and p d t of p ph l c r c l tory f lu n ma Th s d et th fail t tudy dequ t ly the dyn m f c t rs f th p pheral ci culation n in th human b g Ut l c ntly all att nt on h s b n f cu d o th d d pla m v lume and on t atment m dat est g th blood lume It i ev n q esti n bl wh th th well des rv d popularity fh man pl m th treatment of ho k s ff ct d thr ough a est t n

of lost bl d v l m beyond th t wh ch the v l m f pl ma g en dd to the circulat o H m n pl m ho e e h m ked p es or eff ct on th int m cul p es e

The authors o te a po tio of the rart cle to a r w l th k own fact conce i g the dy amies f th p ph al c rcul t on el ted to ch nges in the i tam scula pr s ure in m A m ked d op m i t m cul p essure which ch d its m mum betw th s th a d tw lfth post pe t e hours was c n t ly fo d ft s g al pr dures Uninte rupt d se l d gs f tram cular and en p ssure m d d g and after p at n up to th d elompt t f su g c l h ck h v b pre r ly r po ted by the authors The lest a d first ph ome on t d eith d g pe t r p e d g the t of g al shock was d cl n th l el of i tam c l r p e Th s occ r d in f m tw ty to ty m tes ally i r r f d i m nute f t th p t i a b gu Th e t ph ome oted wa th d cl e n o p es which l ay f ll d th t f the intr m cul p s by f m s t to sift m t s Th fo m r t m wa n t d i ap dly d el p g h ck wh ch h p p ed th op at g tabl Th fall o pre w oted th t two min t s befo the gns of p ph al c l t ry fa l appeared D i g the s l p t e p ce du e the i t l d cl f e p foll ed that f the tr mu cular p ess ew th a i terval of fifty m ute A gnific t lat d p t e o s p essu ccu g in the h d dow p t (Te dele b g po i t) s an nd at o of a f l i g no s ret m The blood et r g f m th t s s i po d int th gre t ve s n ar th h t (the pre nt icul eserv f v n Reck l gh e) Afllngve u pes i th po i t i d eates d cr as d f l w of blood t th pre tricul reserv r A p d decl ne n p e ure ccu red n z p te f s fo m a c mp s t d h g l l w th o t f p ph al c rcul tory f l i o i t h p p d while the pat t w s till i th h ad d p st Th l west po i t s t i d by the t m l r ad n s p es esccured f th t l d e and c moid d w th th app r f p ph al c r l t ry f l re Th w tru wh th r not the p ss es d opp d r p dly r w dly d d the symptoms d gns of sh k appe r d e ly or late Those p t nts who sh d nly se e d pres on aft r p t i s b lly d loped p ripher l c rcul tory f lu b tw e the s th and twelfth post p at h rs whe t was n ted th t th i t m cul d n p ess es had c m d t lly tt d th m mal po t of d cl The perph l c rculat mm dat ly afte p at n appe d ad q ate but s b g ly the lin cal p ctu becam indist guish bl f m that se in pati ts wh de l ped sh ck p dly In b th nst p es re as low as r cm f w te a d i t mu cul p ess e d w t 8 mm of w te h e be co d d Th th l west le i f t amuscul p es r r h ck c

curring before death. The alteration in the intramuscular pressure is noted in the dynamics of the venous pressure immediately and after operation showed a constant coincidence between (1) the loss of muscle tone, (2) a loss of venous pressure and (3) the appearance of peripheral circulatory failure.

The studies here described indicate:

1. Within certain limits a considerable reduction of circulatory blood volume is compatible with an efficient venous circulation provided that the intramuscular pressure of the foot is important; the dynamics of the peripheral circulation is held at an adequate level.

2. A physiologically effective venopressor mechanism coincides with an adequate peripheral circulation; one that has failed is coincident with the appearance of circulatory shock.

3. A normal peripheral circulation coincides with a normal decreased level of intramuscular pressure.

4. Human plasma has a decreased pressor action on the intramuscular pressure.

5. Nephthamide has a marked pressor action on the intramuscular pressure. The pressor action of plasma is slow as it requires from seventy to one hundred minutes and the administration of 750 c.c. of plasma is necessary before the pharmacological action becomes manifest. The effect of nephthamide on the blood is very rapid. It also heightens the venous pressure mechanism within from five to ten minutes. Therefore it is a good administration in doses of from 5 to 10 c.c. as a contrast to the severity to which human beings react to plasma.

6. The presence of rabbits of the dynamic factor of the circulatory system (first theoretical level of

the intramuscular pressure and late phase of the venous pressure) corresponded more closely to the appearance or regression of peripheral circulatory failure than did changes in the plasma volume amounting to less than 500 c.c. (approximately 2 units of plasma).

The authors believe that the chief lesson to be derived from their studies is that greater emphasis must be placed on investigation of the dynamics of the peripheral circulation rather than upon the volume of blood that is available for the circulation and this must be done at the bedside.

MATTHIAS J. SIFERT, M.D.

Diamond, L. K. and Abelson, N. M. The Demonstration of Anti Rh Agglutinins. An Accurate and Rapid Slide Test. *J. Lab. Clin. Med.* 94: 3.

4.

The development of antibodies against the Rh factor in the sera of Rh negative individuals may result in intragroup hemolytic reactions following transfusions of Rh positive blood cells.

According to the authors the present laboratory tests for the determination of anti Rh agglutinins in the sera of sensitive individuals are inadequate. It is claimed that with the block gel test of Weyer and the incubation test a more rapid result may be obtained in 50 per cent of the examinations. This is believed to be due to an inhibitor substance which interferes with agglutination.

As a result the authors have devised a slide test which demonstrates Rh sensitization in a high percentage of tests than heretofore and thus gives a truer clinical prediction of in vivo blood reactions after transfusion.

BENJAMIN G. P. S. JOFFE, M.D.

f the Red Army fr m ep l m c lisea < ha bee
ach ev d by the s mult eou a l c rrelated ctivity
f all ts concer ed and is due to the fact that
ant p demic me sures among the troops are not
carried ut by d vidu l special ts but by th
Med cal Corps as a wh le

Jos PH K. NA T MD

Graham J D P High Blood Pr reast B tle
Lanc : L d 945 248 39

The blood pressu e f the normal solli r th n
the gel m ts f eigh teen to forty y ar ave ag s
12 /8 mm Hg P s ures ab v 155/90 id
t l c p es u s of 100 mm Hg were r g d d as
hypertens ve

The present est gation not d the eff t f one
v a of acti warfa c n a n a m o d b r g d i the
W i r m De e t The resti g blood p sure p lse
d h m glob n e d ngs we e taken of ll rank f
llers n m b r ng bout 695 men fr m fo t e ght
weeks fte b ttl

Among the latt r 26 9 per c t were f d to h
d a tol c pressu e f 60 mm Hg or g t and
38 per c t had a s y t l c p r e s e excess f 160
mm Hg In th hype te s v group 21 ga e y m p
t ms of he daches palpitation and d zy pells
Aft a cont nu ti f the est period it was fo nd
th t th mean blood pressure had parti ll turned
t normal n 28 hype t s v e soldi rs The d cy
f th bl d pressu e t r turn to rmal n pit f
chang i lmate l t or dehyd at ndicat d
th t this as f n u o g e o r g d e t rel f f
pers l iety B J M C P S MD

Walk R M d Hut hi n W R S Abd m
in 11 n j ri at th B ll spit i f t Lo d
945 48 99

The a th rs rev e co c nst th c t m t f d
th compl cations h h dev l p d 55 old ers
(w nd d the bd m n d r ng the amp g i
v mandy and the L v Countr c) ft they h d
ar ed t c i l n has l osp tals n the U t d k i g
d m The go d c d t n which th s patie ts
d at the h sp t l attr buted t the lib al
mpl y m t of blood j l a m nd aln inf s
r t e gast e suction v tem c e ll th apy
e e cas d t the policy f x t i g or
clud g all w u d s f th larg ntesti

It is contended that pat nt h oha e h d und
f th abd men or f th buttock h ld be
m l as s as th y a e ettle l l i a d that
v toward sympt ms h a p a mit g r
h matu i mu tbe account l f a well s a y e
p l e rat r t m p t e l i f v m y be
l t a e s l ab cess th ab l m t a
f ted w u d hich is l a g a l e q at ly

Th on t o f o m t g d e l e k y p h u l d s g
gest cute test l bstru t n t a dhes
ba l n l f m at t t th l g os
l par t m y h l l l u r l k t

Clos f c l o s t s l f f c l l t l l a s t l
th f t l i t th upper p t of the mall tes

time mav be del y d u til an opportune time The
p t e n s g r al co d t i o hould b adeq ately
resto ed first

Scrupulously caref l techniqe however is essen
ti l i f th operati ns for closure of fecal fistulas are to
b unif r mly successf l

S p apubic bladder fist las usually close spon
tancou ly but befo e th tube is removed it is essen
t al that the w u n d s in the bladder are healed and
th t th e s no obstruction to the urethra If the
bladder w d s have not b en sutured at the pri
m y peratio they may req i e r pair later

Add min thorac c ds after their ca l v treat
m t present p cul ar problems the injury to
each cavi ty requi g att nt as a sepr ate entity
prov ded no c mmun cation between the two cavi
t i s p r s t S r r h e v A Z i m M D

Ma F l n e J A Compound Fractur in Wa
1944 La t Lo d 945 48 35

In a gr p of 120 fractu es among the Diep re
ca alities the i c l e c f steomy l t s follow g
Trueta s method of tre tment w s bout 12 per cent
When there s a d r ced volume of circulati g
blood or a l cal inte fe c e f c i culati n due to
tensi ve thrombosis or a teri l damage an
pen wound is much mor l able to i fecti S l f
drugs a d p e c l l n play very impo tant role but
th surg o still mu c a ry out basic surg cal pri
ciples A n v l ble muscle should be rem ved and
every bit f v bl sk n m t be s a ed

A g t majority of pat e ts with compound f ac
tur s r ach d hospital in Engl nd w th n six days
f th r be g d d Bur d sutures were not
u ed c p t t l g t e n o c c a o al essel No effort
as mad t close the u d s The athor p nts
o t h t the anterior b r d r f the t b a p e don
d ther tructures f th d rsum of th h n d a d
foot hould be cov r d as soon as po sible b cau e
they te d to do v r y b dly if left open that plates
d s c e w s hould n t be u ed unless it s ab olutely
eces ry that p p imm b l i t i o n s e o f the
ca d i al points of s ccess and th t the open com
po d f ctur w u d has been closed successfully
f ter a p riod f two mo th

A s rvey of 200 cas s f comp unl fracture i
Ca ad n ho p tals in E g l nd was made Cl sure
was su c s ful n 8 per cent of cases Fractu es of
the f m we e closed s ccessf lly n 7 4 per cent
f cases a d fractures f the humeru w e closed
c c s fully i 88 p cent of cases Among 44
f act e f the lower leg s c c s s l closure wa
b t a d e 68 p r cent f cases and amo g 23 f ac
tures f th f a m 9 per cent wer s c c e s f lly
closed Se r al fract es in l ing both bones of the
leg were i th nsat f c t r y g r up among 14 cases
sat f ctory res lts we btained in o ly 7 The
a rage i t r al b t we p r m r y s g e r y nd clos
wa n a d t th s d y 150 000 u t
f p e ill a th g m t u e l f o m
p m y s g r v n t l compl t n of therap y hich
as accomplished in a a g p e r i l f t n a d

eight tenths days A little v o e h l f of these cases received an average dose of 27 gm of sulfa drugs over a period of s x days In the Ital n theat 9 f one group f 3 f ctu es we e clo ed and 71 of these were closed successfully fa led to close a d f the s nly escap d b n inf ct

During five years of war the c has been ch nge of opinion f m th clos d plast r to open wound t atment and now to del yed clos in 90 per cent of all compound fractur es A gre t sa g has b en made in b th lif and l mb and a red cti n n ho pital days The e i littl vid nce th t ch mother py is espons ble fo th incr ased succes Two groups of cases have been t d d th one gro p r c ving prophylact c pen culln the oth receiving th r inadequ t amounts o no penicillin therapy Th use of the lf namides along these s me g neral p inciples has hown a similar esult Early adequate u g ry compl t mm bilization and soft t s suppo t a st l th basis fo s ccessful nd results

RICHARD J B NNETT J M D

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

B njamin H B Abrenberg H W and F ur
l s C J The Submu o al M cellat n f
H morrh ids A S g 945 39

M thod empl yed in th ea ly 800s by the F nch sur g ns a still nu f r th surgical tre tment of hemo hoid N rly eryone has hemo rh ds in one form o th r and the c mpl cat f hemo rh ds nd hemorrh id ctomies m y b very d st essi g and oft times d abling

S nce th pre ent war the authors hav een ma y you g men devel p hemorrhoid b aus falter d det nervou tens n dl k of propert letf ch t es

In v ew f the f t th th morrhoids sthe t n lo e t mal ar in truth v nco e v ins f th rectal a ea t s d fficult t done the p es t d y p ctic f clamp d cis n Since the dise e s of th blood v sel primarily ther s n d f r th sug ont s crif e l g mou t f th ectal m s und ly g conn t v t s e and v m s cl An pt nalogy w uld b that f su eon wh n att mpti g to cu th patet f fvarico t of the lower tr m ty m ly cl mp d cr ss th v rix nd s d skin m sel a dev n n rves

The auth rs techn que f h m rrh dectomy s l ng a t m l i nd t att mpt to p s r v a n r mally f n to ing ctal t be Th result has been that th m m n qu lae f h m rrh dec t my ha b n d ed to a minimum a d th op ation itself h s be n rpr ingly s mplified

The esth t c f h c is caud l b l c local infiltrat n a d the p s s s d ha e b n th the lith tomy th Bu p t n A ca d f l p to cop c am t on is r t n ly carr d o t v g rous anal dilat s ne d ne A mall l ar c si n perpendicular t th x i of th ct m

mad with the knif in the sk ppr v m t l 3 cm from th base f th first extem l h m rrh id Th incision lly just outside f th p m ted rea wh ch s rounds th us r appro imat l y 5 cm f m th mucocuta eous bo d \ t the med al dg of th i c sed sk s gra p d with a All s fo cept Hold g the f r cept up on th ha d th muc us membra e s d s ect d f f m the hem rhod w th l y c sors Th d t s the car ned pw d l k m w th th fi ge in th ct m gu de ntl Hult l a h d Th compl h d th nti d d hem rrh d es s l is mo c ll t d by h t b tes w th the c i rs After compl t ca f l m r ll t the sc sors a e withdrawn a d y r d nd t e cess e muc us membra e is r mo d w th V haped exc s on A mlar p ced u i carr d t th m g h m h dal tags An p rca e gau p ck may b i s t d f r hemost nd m ed th f ll g morn g H t sitz b th st tut d the th d day

HARRY W FINE M D

B wn M J Surg ry t High Altitude Am
J S g 94 67 436

The St t H sp tal at Camp Hale l th Rocky M tain Cl do us d the local f r th r p t Th lttud oo f t Th b r m t c p es e is d ced f m 76 mm of mercury to bo t 5 mm f m c ry The p tage of y gen th r s b t th me at s l v l Th o h th y g n the pat l p es e of al ol r r r d r d i f om 6 to 9 mm f m cury

Eth r al eo n c mb ato was n t s t fa t r y d when it w sad m st d by th p d p m thod ab ttw eth al m ut ed d f a o d n ry ope t w eq ur d at that ltt d O p r i d f e ght n mo th s th ext t of the u e of a esth t cage t wa s foll ws

	Anesth	Ag	N f T es Cued
Local	ocain		6
Spinal			
	A P ocain HCl		68
	b P tocan gl		3
	Sodium pe t thal I V		
T p cal			6
N r v	f i d bl ls		54
Inhalat	th t cs		

W th the p nal anesthsia th e ere m n r co plicat os cha nau a mit g d p f blood p essu e d p l l r The e w e r 5 f l u s th pinal nesthes Ther w o a esthet c d ath Wo nd h aling was n t lte d by th b ge f alt t d Th e wer 76 m j pro d res d 1 084 min p ed es Th r we 9 pr m ry wo nd infect Th e w e serum pock t r mall h m t m Gas ga gre d p d n compound f ct e f the d a d l wh h had been t eat d su cally Wo d h l pr m ry d d r y n f ted wo l s w a would b xp ct d th m sth t t o d ry h t des B h l g w s n t d l yed Th w re

193 postoperative complications among 980 operations. Of the 193 postoperative complications 98 were connected with the respiratory system. There were 4 deaths 1 of which was due to pulmonary embolism the 5 cond as due to edema and pneumonia of the brain the third and fourth deaths were due to severe chest trauma. The sterilization of materials instruments was carried out in steam pressure sterilizers at from 18 to 20 pounds of pressure with temperatures of from 24 to 5 F a day sterilized in time between 10 to 15 minutes.

Clinical laboratory results showed a slight elevation in the red blood cell count and hemoglobin. The differential blood counts showed no significant variation. There were no evident changes in blood chemistry.

The general surgical lesions requiring operations were for the most part congenital defects such as hernia hemohidrosis varicose vein and varicocele. There were 35 hernia (inguinal) repairs among 189 men in eighteen months. Among 235 hernia repairs there were 5 primary wound infections.

The medical service described and treated 25 atypical pneumonias. Among these were 1 pleural effusion and 2 empyemas. Simple fistulas required from 1 to 6 thoracostomies. One of the empyema fluid cultures showed a rule of hemolytic streptococcus in which x-ray studies demonstrated multiple pockets. Repeated aspirations followed by instillation of penicillin and the general administration of penicillin resulted in cure. The treatment of a second empyema case was complicated by massive pleural effusion 1300 cc of thin pus were aspirated. Repeated aspirations and penicillin therapy local and general have resulted in recovery.

RICHARD J. BENNETT, J. M.D.

Editorial Note on W. Spinal Anesthesia in the
V. Yung and F. H. Oberlin's
R. Soc. Med. 1945 38 99

A careful record of 1600 supervised cases of spinal anesthesia with a light solution has given the author a simple formula for more accurate titration of the time given, dose, and depth of anesthesia. The following formulae are given for children and adults.

The administration of the hypobaric solution is the most important factor in the success of the operation. The dose is based on the length of the spine. For the first thoracic vertebra to the first lumbar vertebra the dose is 1.5 ml. For the first lumbar vertebra to the fifth lumbar vertebra the dose is 2.5 ml. For the fifth lumbar vertebra to the sacrum the dose is 1.5 ml. The total dose is 3.5 ml. The concentration is 0.5%.

The high spinal timing is used. As soon as the injection is made the patient is sat bolt upright for the maximum amount of time the time in seconds being commenced as soon as the injection is started. The injection must be completed within fifteen seconds.

TABLE I—DOSAGE AND TIMING BY FORMULA FOR SPINAL ANALGESIA IN THE YOUNG

Age	Block to thoracic pain	Time in seconds high spinal	Dose per 1000
5	3	8	
5	4		
5	5	5	1/2
5	6	3	3 c.
5	7	35	4
5	8	4	6
5	9	45	7
5		55	8 1/2
5		60	

H. H. Oberlin, 1st segment to 1st lumbar segment
1/2 1st lumbar segment to 5th lumbar segment

The author's experience is limited to nupercaine and spinal anesthesia. The latter is preferred because of its greater strength. There were 91 per cent perfect spinal anesthesia with alcohol spinal anesthesia as compared with 85 per cent with 500 upercaine. The advantages are the added effect and effectiveness the rapid complete mixing the small dosage needed for exact block levels and the usefulness in unilateral spinal anesthesia reserved for the long operation. Spinal anesthesia for the shorter and most difficult cases is a good for lateral operations and patients require injection very accurate block limitation. Warning of the ampoules is not considered necessary.

An 8-g Trendelenburg slope is considered adequate for intrathecal anesthesia. The patient tilts the head down 5 degrees.

The prone position has no place in the technique described. It is unnecessary and unjustifiable. The patient is placed flat. The height of the block before operation is considered unnecessary except for occasional demonstration. Repeated careful spinal anesthesia has shown no harm to the nervous system. Complete fluidures in the whole series amounted to 2 per cent with only 0.5 per cent in the last 400 cases. Such failures must be due to nature of the drug.

By alternating the position of the table and varying the time that the patient is left in the lateral position unilateral block of the foot level lower leg and whole thigh can be obtained successfully with p. o. caine anesthesia.

No deaths occurred on the table. P. o. caine is not used in the poor risk and is cut down to a minimum if used at all in the elderly. Minute controlled doses of p. o. caine are used if required.

gated slit with an irregular cross section sometimes appeared to be round or oval. In one case the powder appeared at the anterior edge of the vertebral body which suggested that the curette had actually approached the annulus fibrosus. Roentgenograms taken of patients months after surgery in the event of tantalum powder showed no significant change.

To date there had been no opportunity to examine a case with symptoms suggestive of recurrence of a protruded disc. The patient has been in the following condition since the implantation of the tantalum powder. In one case it was possible to re-examine the patient in the tantalum powder bed. The patient developed an anterior protruded disc adjacent to the original Currettment removal. A patient's history with 15 cc. of yellowish pink material plus scattered fragments of black material. Histological examination revealed mild degenerative and regenerative changes. Tissue reaction was not considered around the tantalum fragments. MAURICE D. S. M.D.

Niel en J and Strandbe g O Roentgen Treat
ment in Cance f th Laryn At d l
Stockh 94 3 89 55

Coutard's protracted fact al roentg treat
ment of ca c r of the larynx was first adopted t the
R d u m c e r r n C o p n h g e n s 93 4 c e t h t
time ab ut 600 cases of t m o s i p p r r e p a
tory and digestive t acts have b e n t d among
them 63 of intr laryngeal cancer These are d
c u s e d p a r t c u l y f o m t h p o n t o f v e f d t r
m i n g t h c o m p r a t i v e l o f s u r g c l a n d e n t
g t r e a t m e n t T h e h i s t i s f i g i f t h e p a t i s
r g i v e n t o i l l u s t r a t e t h e a u t h o r s c l a s s i f i c a t i n f
t h t a g e s o f t h e c o n d i t i o n a d t h e i t e d
e x t e n t o f t h t u m o r s i n p a t i e t s f e e d f s y m p t m

Extensive squamous cell carcinomas in the larynx. The patient was a 55-year-old male who had a long history of smoking and alcohol consumption. He presented with a persistent hoarse voice and a lump in the neck. Physical examination revealed a large, firm, nodular mass in the larynx. Laryngoscopy and biopsy confirmed the diagnosis of squamous cell carcinoma. The patient underwent a total laryngectomy and a radical neck dissection. Postoperative course was unremarkable. The patient is currently free of disease and has a good quality of life.

n llb chnourag g thes cases
 t llstrat egve whch show th tes of the
 t mors and th appe c f the lry bfre nd
 aft rre tment i a mb fcaes Thet ble f
 es lssh th t22p re t fallpat ents cma d
 sympt mfe f fcv rsorm re 33pe tfor
 the 3e rsormo 46pe ctf o yar rmore
 a d 49pe cent r d ed p ma ly fce f
 ympt ms All f the p t ents wh cence i tages
 a d a r mai d f ymptom f year or
 m e a d d 53p cent of th i tag 3a d 20per
 cent of th instag 4

After completion of these results with those of the authors conclude that cancer of the larynx stage the younger roentgenite time it may be difficult for the cancer is not very small and

ical zed to the middle one third of the vocal cord
roentgen treatment probably is to be preferred. In
stage 2 the Couthard treatment is to be preferred as
it seems to give results that are as good functionally
as lasting in stage 1. In stage 3 the Couthard
treatment is to be preferred in carcinomas of the fals
vocal cord which metastasize early and are quite
adhesive. This is a good radiological cancer
and a poor surgical one. In fixed carcinomas of
the vocal cord surgery may be used if immobility is
complete if it is not complete a test irradiation may
be used and the final decision between surgery and
irradiation may be based on the results of this. In
cases of mobile stage 3 glottic carcinomas laryn-
gectomy is to be preferred this is a good surgical
cancer but a poor radiological one. Carcinomas of
the subglottis of Morgagni are intermediate between
those of the cord and those of the subglottis. As
they metastasize quite early a test irradiation may
be tried. In stage 4 irradiation is the only possible
treatment except that tracheotomy may be used as
a palliative measure. The only cases in which free-
dom from symptoms can be brought about by exci-
sion are those of the false vocal cords. In
other cases the greatest relief is probably to be ob-
tained by small palliative doses of irradiation.

AND EY G MO CAN M D

Gylst rff P tersen II Th RoentgenT eatme t of
C rcinoma of the B a t A t adiol St kh
944 5

The authors discuss the results of treatment of carcinoma of the breast at the Radium Centre in Aarhus from 1940 to 1936 with a view to determining the value of postoperative roentgen treatment. During this period 61 women were treated for carcinoma of the breast and 3 men and 4 women for sarcoma of the breast. The material is divided into 3 groups according to Stenhal's classification: 25 per cent of the material as in group I, 58 per cent in group II and 16 per cent in group III. The five year survival rates for these three groups were 43, 7 and 4 per cent respectively. The material was taken from 47 different hospitals and the best results were obtained in the patients operated on at the Aarhus Municipal Hospital. The five year survival rate among these being 73 per cent. This was probably due to the fact that at this hospital radical operation with removal of the axillary glands was performed consistently. Another possible factor was that postoperative treatment was given much later after operation at this hospital. Twelve days after operation the average while at the other hospital thirty-eight days after operation as the average. Treatment for recurrence or distant metastases was given in 129 cases and in 8 per cent of these there was a five year survival rate of 10 per cent. The average survival rate for inoperable cases. These were treated with a good palliative effect was obtained but no lasting results.

Untoward reactions following the administration of the substance were seldom observed in fact they occurred only in connection with 3 injections. In 1 case the patient became nauseated and had a single attack of vomiting after receiving 10 milligrams by mouth; in another there was a general sensation of heat, light perspiration, increase of temperature, a diarrhoea lasting a day and in the third there was a few days diarrhoea and rise of the temperature to 39° C. In none of the cases were the symptoms of a dangerous character.

The effect of the artificial radioactive substance on the hemoglobin percentage and the white blood count was as follows: the fall in the white cell count and the reactions observed were similar to those after the exposure to roentgen rays. In the cases of lymphatic leucemia the hemoglobin percentage was almost unaffected although radium sodium speedily penetrated the erythrocytes. Only in 1 case was a count made of the thrombocytes which seemed to occur in increased numbers after treatment with Na. On the other hand there was in all of the

cases except Case 3 (which later proved to be refractory also to roentgen treatment) a marked effect on the number of leucocytes in the blood especially after the largest and most frequent doses. No effect on the differential count could be detected. In several cases about a week after the beginning of the treatment an increased swelling and some tenderness of the palpable lymph nodes or the enlarged spleen was noticed and this was followed by a more or less distinct diminution of the size of the organs in question.

The change in objective findings was accompanied as a rule by subjective improvement: the patients became stronger and the itching of the skin and the perspiration grew less or ceased altogether. The effect of radioiodum on polycythemia vera was only slight and transitory.

The number of cases of leucemia treated is yet too small and the time during which the patients have been observed too short to warrant any definite expression in regard to the permanence of the effect described.

JOSEPH K. NARAT, M.D.

e c l o t e o p o r c v n d t y c a l f a t
It s f i t e s t h a t f n o s y s t m a t c x a m i n t i o n
m a d e t h e f r a c t u r s m t i m e s i n t d i c o e d u n t l
s e a l m n t h l e t e w h e n i t a l r e a d y m a y b n t h
p r o c e s s o f h e a l n g

In n e c a s e p a t f f h e b n e w a s e m o v e d f o m t h e
f r a c t u r e d a r t m c o s c o p c s t u d y I t w a s f o u n d
t h a t t h b n m a r w a s d e s t o y d a d t h p c
t u r e r e s e m b l e d t f o s t e r t i f i b a l a d i g t
n e c b i o s o r n e c r o s o f t h e o s s e u t i c T h e
w a s n o c e l l l a t i n a n d t h o s t e o b l a s t s a s w e l l
a s t h o s t o c l a s t s w e c m p l e t l y a b s n t T h s u g
g e s t s t o t h e a u t h o r t h a t t h e p m r y c a f i j u r y
i t h d r c t e f f e c t o f t h n t g n a y s o n t h e c e l l l
e m e n t s t h m s l i v e s T h e n u t r y d i s t u r b a n c e
u l t i g t h f r o m t h e v a s c u l a r c h a n g e i c n t b u t o r y
f a c t o

T h c o c l u s i o n s r e c h e d t h a t s s e o u c h g s f
t h e n e k o f t h e f m r r e p r e s e n t p s b l c o m p l i c a
t i o n s o f h v v r d i t d u r g t h t a t m e n t f
c a c m a o f t h c r r u t W h e e v s u c h p
t s d l o p p i n i n t h e h i p a d t b d g a t
i t h u t t h e b n g g y n o l o g c a l v i d n c e f c u r
r n c e f t h c a c i n m a r a y a m i t n o f t h e p l
v i s h o u l d b m a d n e l y T L v u r i a M D

MISCELLANEOUS

Thygn J E Vid baek A and Villum I Th
Treatm n t f L u c m i w i t h A r t i f i c i a l R a d
a c t i S o d i u m A c t a d l S t k h 944 5 339

T h n t e a l d a t i o n t h e p v w i t h a t u f a l
d o a c t i v s u b s t a n c s o f f e r s t h e f l l o w i g a d
t a g

B y e n t r a l o r p e t e l a d m i t t e o f t h
d o c t v e u b s t n f a r m e i n t m e c t t
b e t w e n t h u c e f t h e a d t n a n d t h e b j c t s
e s t b l i s h e d t h n c b b t i d w t h t h l
a d m t h a p y

2 A s t h h a l f l i v e f t h t h c i l r d c t
s t o p w i t h a f w e p t n v r y h t c m
p a r e d t h t h h l f i f e f r d u m t h e f f t o n t h e
g a i m s o n l y l m t e d n t i m t h t t d g e
p o b l e A s w k n w t h p e m n t d t n
f m d p o i t d r d u m r t h r m c a e s c h c
v t c a t n w t h p l a s t c n e m a d t o n
s t e i t n d t h e f m t n f s c m

3 T h e i n t r a l a d t o n c a n b g n t h t s
e f f t w l b e t h c h i f y l c a l d o m o g l
d a c c d g t w h t h e t e i t p e g v a c c u m
l t e s n t i n r g n o d s t i b t e s t e l f m d f
f s e l v T h l c a l d d t n w l l n d b t b e
t h o w h h w l b o f g e t s t n t f t h p y

4 I t p b l t o g v l w t n t v v t t
m e n t E p e m t s n d a s o n i n g m t n d c a t
t h t p t c t d a t i n w i t h l w n t e n t y a
m o m a r k d i l y l c t i c t n n p l a s t c d
l u c m t s u e t h n m i n t n s d t n f
h o t d u t n b c a s t h p t h l g a l l a c c u
m l t e t h e g n y e r g y m c m p l t l y t h n
n o r m a l t s u e s w h c h g n t q k l y d p r
t h j u e s c a u d b y t h d t n

5 T h c t n o u s a t i r e s l i t i f r o m t h e
u s u a l e t g e n a d r d i m t h e r a p y a r i e d
T h e o f t e n v e r t b l e s m e y n t i c a t n c a l
b y d e c t r a d t h a p y i s e n o n l y m i l f m
w t h l a r g d s e s f d i o c t i e s u b s t a c e

6 T h d y d s p e d p p l c a t i o n l l
t m a d i m a y c a s e s w i l l m k t p o s i b l e t e t
t h p t i t s i n n m b l e r y m a n n e r

A d w b c k t o t e n l d u m t h e r a p y i t h a r t
f i c l d o c t i v e e l e m e n t s m i g h t b e f d i n t h
l a r g e a n d c o t l y a p p r t r e q u i r e d b u t t h s m e
d r a w b a c k a p p l e s t o c e t i e t e n t t o r d

a d a t t h r a p y T h e d o c t i e b a n c e c a
d l y b e t r a s p o r t e d p o d e d t h e t n s p o t a t o
t u m d e s n t c s t u t e t o o l g e c t i n o f t h e
t m e w i t h w h c h t h b t c e d c a y

T h e o l y t i c a l d o c t i v i t p s d o f f r
f o r n e r n l t a t m e n t o f l e c m a s r a d i o p h o
p h o r u P a p u r b e t y m t t r w t h a h l f l i f e
f f t e e n d t h r e t e t h d y s T h e a u t h o r d

n t h r b t d o o d i m N a h i h m t
b e t a y d y h a d g m m a r a y h d r t h n
t h o f r m d m a n d a h a l f l i f e o f f t n l
e i g h t t h h s T h e m e r o f i t d t r b t i o
n t h m l g a m i d f f r e n t f m a t o f m o s t

f t h t h e t f i c l a d a c t i e s t o p e W h e
t h e c u m u l t m o e r l e i d f f e t r g s
a d o d m f o u n d a l m o s t l u l y i n t h
t n t l l u l f i d o t h a t i t d b t n
n d y a c t i s d i f f s I c t t t r a d p h o s

p h w h i c h v r y l e s t h e b l d t e a m
l m o s t n s t t l e l s o b t e d w t h d s o d i u m
s o a s f i n t n m u t e f e r i t s j c t i t h e
v T h e r e t i w h i t a k e p l a c e t h r o h t h

e s r y l R d s o d m t h f o s e m
t b e t b l f o t e l g e a l l d t i o f l o w
n t n t y I t p b l b l t h t t h e g a t i m e f a c t r
h e m a y t b y w a y f e t i z g t h e l u c e m c t

t h t t h e m g b e t e n t h e r a p y c a n d
t c d b e c m e w d e E t a l l l v e o e t g
t t m e t w t h m l l f a c t o a l d s e s h a s f r e d y
p r o v i d f l u e l e m i f o a m p l n c a s

t h t h d b o m m o l f r c t r y t l c a l
r d t b t t h e m e t h d p e s e n t t e c h c a l d f i
c u l t e b e d e s b g e p n s i

W h i d p h o p h o r u s e m t s l y a d d y b b
b l b t y s d o s d m e m t s l o v e r y h d
g m m a y w h h o n l y p t l y a b b e d e

t h c k l y e r s o f t A c u i c u s e q e c e f t
s t h a t w i t h m a l l r r a d i a t e d o b j c t s h a s m
n l y a l l f t h e g m m a d t i l o s t

E i g h t p t s w m a t e d w t h a d a t s o
d u m v 7 t h h c l y m p h a t c l c m a d r
w t h p l y v t h m e a A f t b o l n g a d d i l u o
w t h p h y o l g a l d m c h l r i d s l t u n t o a l
u m f c t h e b t a c w a s s l w i l y n j c t e d i
t h e a s a p o s b l e f t e t h i t h a d
b e p e p a d i n n c a s w a m o e t h n o n c
t n g d l y T h e s g l d o s v r d f r o m 2 3 6
m i l l i c u s e s t h a t d o s a g e f r o m 6 t 178 m i l l
c u s f m t 21 e j e c t w h c h w e u s u l l y
g i v e t i n t r a l s f t l a s t f r t y e i g h t h r s

Untoward reactions following the administration of the substance were seldom observed in fact they occurred only in connection with the injection. In one case the patient became nauseated and had a single attack of vomiting after receiving 10 millicuries by mouth. In another there was a general sensation of heat, slight perspiration, increase of temperature and diarrhoea lasting a day and in the third case was followed by diarrhoea and rise of the temperature to 39°C. In none of the cases were the symptoms of a dangerous character.

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JOS. H. K. NAR. M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Buch G E and W n T Th R lation f Total
In n ibl L of W ight to W t Lo f om
the Skin and Lungs of Hum n Subject in a
Subt op cal Clim t Am J M S 945 09 6

The rel t nsh p of in e ibl wat r loss f om the
lug t wate l f m the k i h b n stud ed
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s sibly from th sk nd I W p e nts wate
lo t nens bly f m the l gs In th n mal est n
subject I W r p es ts ab t 93 p t of I L
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t nns bl wate l s

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Th lo th gh th l gs 52.3 pe c t of th
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th ough the sk n

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l f w t th o gh the k n f th de d th
th o gh th k f th lu g

Th kn an ffi t h b to of th l s f
w t by d f f s o S MUE KAHN MD

W lk J J nd Sh nkin H Studi n th
T m l Synd m ft Burn II Central
N rv u Sy t m Changes a Cau f Death
A S g 945 3

In the co rse f l cal t dy f b t ma
943 and 944 6 pat ts w b rv d t d f
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pl t f th dd d ths ccu r g th
t m pha e f b

J H N E K TR MD

M L ughlin C W nd H ll nd J L S tt
W t U lers f th Et mtl Th l O cu
n n J p n se Surv l rs L S A M
B ll 94 44 494

Th th rs po t th es f 3 J p e
ors wh h d b d ft l f e b ts f pe d f
f m i t l d y Th d d l w e f d
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rv rs h d f i st degr e b f l l
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n th f m legs th gh d b tto ck f 6 f
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bs q tly l ghed l g l c rs h ch d
f mo 5 t 3 m Th y app d p c pally
th e t n s r ur f ces of th e tr m tes F ll

these lesions appeared as deep circular or oval punch-out ulcers with a pinkish gray granulating base. The ulcer edges were extremely sensitive even though there was no inflammatory reaction. When several of these lesions reappeared on the legs or forearm, a moderate degree of edema of the feet or hand was present and fever ranged from 100 to 102° F.

Fifty survivors showed similar lesions on the palms of the hands though new lesions on the soles of the feet on the neck or on the face. There was no tendency for these ulcers to coalesce rapidly.

The treatment consisted of the application of sterile dressings with or without the use of a tetracycline and sulfadiazine powder. The final application consisted of a careful cleansing of the extremities and the application of sterile boric acid ointment as a preservative dressing.

H ali g was slo Smears tak n from the ulcers
sh w d few organi ms No differe n h al ng t m
c ld be ted in those cases n wh ch t eptics
ulfa lamide powder had been us d n the initi l
t eatment n c t ast with th s n wh ch only
steril dry d essi gs we c ppld Af k pyod rma
devel ped i one case These lesions seemed to co
respond in many ways with the so called tropical
ulcers or des rts s r p t d f m the African
the t of war

The author believes that the salt water is the most important etiological factor in the production of the ulcers. Vitamin deficiency and dehydration are considered as important. No evidence of dual presentation of the patient from immunological factors. The lesions were apparently of bacterial origin. The prevention of salt water immersion is undoubtedly dependent upon the protection of the exposed surfaces and individuals advised. If possible, the blisters may be treated with antibiotics applied to the skin of the extremities and buttocks. A physical examination by the individual who are cast adrift.

RICHARD J BENNETT J M D

De W L and Nippe t P H Clinical Aspects
and Treatment of Cutaneous Cancer J W
As G org 945 34 5

The death rate from skin cancers doubled the metastases is comparatively high and frequently the physical as well as the layman is to blame. Family as ill as last malignant tumor met with skin squamous epithelium by the patient because the sunbather the growth of the and usually the lesions appear in recent times the individual who has been told by the physician that the

The appearance of a large cell of the kidney
usually corresponds to the physical and many
cases are diagnosed as moles, warts, fibromas or
other benign tumors. Because of many diagnoses
made by the residents, it is difficult to treat the
tail.

Excluded from the list are the benign tumors, which are placed in two general types: the benign epithelial tumor and the benign mesenchymal tumor. The benign epithelial tumor is the squamous cell carcinoma. The benign mesenchymal tumor is the fibroma.

tastases are comm 1 th squam a -cell carc noma
they ar extrem ly rare in the b al cell ca cin m
III a l sed surgery may cur th sk n cancer but
al o cau unn c ssary deformity Overzealous roent
g a d r dium ir adiatio s n t o ly carcinom g
b t may b dangerous Squamous-cell carcinomas
may devel p in sites of a rad o dermatitis These
ca cers must be removed surg cally Surgical treat
mt n s als r o red for sk ca cin mas that d

lip in such diseases as xeroderma pigmentosum, acrodermatitis chronica atrophicans, and lupus vulgaris. A mild erythematous eruption is also common in epidermoid carcinoma which arises in areas of scars from burns. These scars consist of fibrotic and relatively avascular tissue and therefore are arid in these areas are not radiosenitive.

The authors share the experience of others; the treatment has no advantage over roentgen ray therapy in carcinoma. Radum is more convenient and for this reason more efficacious when the disease is located in inaccessible locations such as the tongue, larynx, trachea, and bronchi.

Three hundred and four patients with skin cancer were treated and observed by the authors for one or more years. Of the patients, 91 had squamous cell carcinomas (3 per cent) and 23 had basal cell carcinomas (70 per cent). Only early cases of squamous cell carcinoma were treated.

Cures were obtained in 97 per cent of the basal cell carcinomas and in 84.6 per cent of the squamous cell carcinomas in the great majority of the cases. The authors used some surgical procedure or electrocoagulation with cuttage. This was followed by roentgen ray radiation and in a few selected cases by radium irradiation. With this combination of methods they obtained a high percentage of cures and also good cosmetic results.

Jo H K Nae M D

GENERAL BACTERIAL PROTOZOAN AND PARASITIC INFECTIONS

E gl h rn T D and W llman W E Filari st In
S ldi rs n n l l nd in th South Pacific Am
J M S 045 09 41

The clinical picture of early filariasis as based on
 based on made on 127 American soldiers. The
 cubat n per d of filariasis as d terminated fr m
 th symptom varied fr m three t f rite n months.
 Early symptoms we e u iagnos bl nd c n ted
 of a e i vomiting and i able pains espec lly
 i th g on permatic cord test les nd th gh
 Within fom te t fourt en d ys f the ltt
 sympt ms crotal i volve ment b cam pp r nt
 75 pe c nt of th old ers Acute p d dymit and
 fun c liti wer c nst nt f nd ngs The co l c uld
 be palp ted and fo nd to b fr m two to fi times
 ts n rmal sz Hydroce l s not observed In
 i v lment of th s pe sci lymph odes w s les
 f equ t Th co rise f spre d was pe y h l
 f m th superficial gs al nodes th more distal
 nodes Only 2 sold rs developed bsc es Thes

w de p with nume ou pockets The pu was
th n and green sh and c nta d o demo strabl
g n sm In a sm ll n mb f cas s s f t n n
suppurat ve swell ngs ere fo nd to ppe r o recur
n c njunct n w th u t ca a Th blood count was
n t character tice cept f th lt pp a in
44 pe cent f th cas s of an eo i oph l h ch
ar ed from 4 to 44 pe t

In the 7 cases mic ofl i and ad lt w rms
w re not dem nst at d The e ly ympt ms d
sc ibed subs ded lowly but were agera t d by
rt on and h t weathe R curr nces usually p
pea ed aft r a pe i d f from one t thr months
These w e c m seve e d p r s tent All f thses
ca s w re evacu t d a ly to th U ted States

Ep dem i g cal t d s reve led that the d e
ncidence dep nd d upon th pro mity f the m i
tary installat on t nat ve ill g s When c n tact
we close with the n t ves almo t 50 p r cent f th
m i tary p rson l becam ncted In ne erv
u it seve l hund ed yard way f om th nea t
village 8 pe c nt of th person l dev l p d s g
of flar asi w th n a pe i d of tw lve mo ths In
another group st t d f m les way f m the
nat ve villages th ncid ce was 6 pe t t the
end of the y ar It s bel ed th t the l t r v
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ea e was n t t n smitt d t nght since th m
q to Aedes sc tlla i wa day b te nd the
camps f the t a y from the nat ve ffe ed the
l a t expo u et fect d v t r s

In 4 pe nt f a r es f 100 nativ s m cro
fila ae w re fo nd in the bl od Th po ibily that
leph nt as s will occur i u ld r s n t l k ly
ince th y w e immediately cuat d home th
repe ted nfect on a l m n ted nd uch q l e
s el phant a b we p clud d

B VJAMIN G P SHAFIRO MD

Smith F R Jr Fil ria A Study 1737 Pati nts
S D agn s d U S A M Bull 945 44 719

Exam nati ns d he lth co ds f 737 whit
p t nt admitt d to a Nav i m b l hosp t l m
New Cl on d n p v d th bas s f r t s t dy In
6 p r cent of the cases the d agno i of fil a i w s
con u d ed ten ble nly up n th past h st y n 33
per nt pon th h st ry nd phy cal m t n
l ewhe 5 pe cent up n phy cal xaminat n
d i g th rep t d p od of b r v ion d n
6 p r cent th d g was u tenabl th gh ut
Sm ars f r m fil i weed c ntm d f r
l g se es f ca es h d h n o st tly n g t
res lts Th a m w th m t f q nt t f th
ympt ms and abn rmal f t g u i tabily n r
v us es and lo f f b d w e f q nt Acute
lymphang ti f th cr t m d lph ntias we
n t encout ed v y f w p nts had th cut
sympt ms of fil as s d ng th t y d f brile
pe ods w n t nt d Th typ cal c t f g l
lymph g t w s f u donly 9 t mes ll th ms
The auth r con d es th t the symptoms and
s igns a ribed t filar ias n Am r can t o ps in th

area in q et on by me med cal exam n rs a e
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would deat The v i nce psychos m tice
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th t me the e no way to p edict nd dual
el pes and pro ess os In th ab e ce f th
d t c t o of the causat e parast th d gnosi
m t est n the phys cal find gs Th p e ce f
th fill g f d gs s bl d to mak te bl
d gn i f f i a s

A c t f g l o t g ad lymph agts th
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gla d m ll nd firm r th n th t comp g
py gen c i f ct a tempo r v m d m n
c d by e e c u d d m hed by r t f l l es
f th f a m m t p ced t th la asp t
th p fical e b g le i bl a palpabl
co d l k f l l e l g a lymph ha l f l l e
a d t e es of th p m t c c da dep d v m
go llymph de p thyo b rra tlymph d s
da hit ry of d t y n S m r sm l d m c
as W ER H NADLE MD

Craig W M Th mp on G J H tt A M
Ba ksd l E E d Oth rs P l illi A
P gr R p t U S A W B 945 44 433

P ac l l i mp d o f c b hyd g y
g a d t least c t m o f t g It m l c r
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pes t It b ha g aed d f m
s lts ith amm m od m c l um b r m a d
st nt m d e t s ith a n mbe f hyd l
co t g b t Th fee c d a d s ral
salts d n th r py
M t h ghly efi ed p ll s a y ll h po
de e d l y s l b l wat a d a mbe foga
solv ts H t g s l t de mposit d d
te to t k s pl t th t me f p h l The
dry lts t th p t cy fo mo ths b t wbe
th lts e l t th y d t t t a p d
v j d c tly w th t m p rat

It q est bl wh th r p c ll h ld be
la d a a b c t o t t r b t e d Th um
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a lo f th b lty of the g ism st p l f t
n l ithm p ges Lat th i a act i
d th n mb f the g ms S n
f t a truggl bet e p l f at f th
i d g t n a d th defns m ha sm f th
h t m l w g f th r t ob c t r l d i s
ff t t l d t v ry most ca Th
c c t to of pe cull n ce r y to mp r p o
l f e t v es de abl b th betwe a d
ith pec es f m y p g c form nt
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oth p es t mes a m ch ecess ry

Wh n j c t d t muscula lyo sut cut eo ly
p n icul a p dly pas es i to th blood It es po ly
b b d he g e ctally It dest y d by
ormal gastr c ret ons D ffus th gh t the

similar to mix d tum rs and a e es entially be
nign but they a e capabl of underg g mal g ant
cha gs The a th rs prefer t d ignate them as
ade omioep thel omas and cons der them to b an
t ty in th ms l es

Their conclusions are ba ed up n the tudy f 3
tumors classif ed as cylindromas nd 3 tumors clas
f d as adenocarcinomas f the palate fhr e co
cepts form the basis of th s st dy (1) th de clop
ment of the homogeneou stroma and its elationsh p
to the pa enchyma (2) the de iv tion of th pa en
chyma and (3) a cons de ation of whether a pure
palati e cylindroma is a m xed t mor or a ad o
cinoma R. A B. R. M D

Hoffm yer J Th Hi t l gical Pict of B st
Cancer aft r P pe ti Roentg n frr di
tion A Study f 50 Case Act d l St kh
1943 4 9

A review of the previous lite ature n th s bj ct
f b east cancer shows that pr p rati e irr d tion
by the fractional method has p oved to be the best
method f apply g radation in the treatment f
cancer of the b east

The a tho d scusses 50 cases which he t e ted by
this meth d in all of wh ch a hi tolog cal exam na
tio was m de after tr tment Phot m crographs
f the f d ngs in som f the cas s ar g e The
total dos ge var ed f om 1 000 t 4 800 centgens
Details of the tech ique ar given

Macrosc pic minat aft r rad at on sho ed
th t n 2 f the cases th tumor had d sapp ared
e t rly in 2 it could ba ly be felt on palpat n
36 there were vary g d grees of decr as s a d
i i ther was no cha ge tall Mic p c am
i ation d n t shov th injury a d dest ct f
the ca c cell ran p llet w th the d c e e i the
s e of the tumor The cance ll e not c m
pletely d troyed any case The ewe e bowe e
d t nct degenerati e cha gs i the ca ce c ll

hich in 3 cases e e so gr at th t it i p ob ble
th t can r sterl ation had been b o ght b t
Ada rep s complete destr tion of the ca ce
cell in 7 f 36 ca es In 7 f th a tho cases
i vading cance cells co ld b f d i th ew
o ly do btful in as and th 3 th rs th
re distinct z es f n f ar v g r dth

A tabl sg en ho g the ar v g d gr es f
v sion in th d fferent ca es Th r s med to b
less mark d invasi n n the c e that ere g en
the h ghest doses No d fi te el ti hip c ld be
d m n t d b t th d ge f i d
thel ngth of treatme t t m r th t l b tw
d ation nd pe at The l gth f t m b

t n s radiat n a d pe ton g n lly ed
f m f ur to s x we ks In case in h ch th
tr l w s f rty d s th r w m rk d pro
l ferat n of c ll i a tum th th ad sh w m k ed
eff cts f irr d ti Th a th b l es the e
f that pe t h l d n t b t o l g d l y d

Th were cells of the pleom rph t pe descr bed
by H l l y and Mein ck in m t f the ca es b t in

none of the cases did they const tute the majo ity of
th degenerated cells There as no tromar acti n
o only a slight one in 37 of the cases In the 13
other cases there v as a medi m o inten e r a tion
There were v slight changes i the blood v essels
wh ch c ld hardly ha been elated to the ch nges
the cell

Th a tho g ees v th Re tern all that the rays
stimul te the nat l tendency f b east cancer
toward h l h g At REY G MORG N M D

McKibbin J P and McDon ld J R The Sig
nificanc f Polymorphonuel r Leucocyte
in G ll Bladde s S g y 945 17 3 9

The p es nce f polymorphonuel ar leucocytes in
the wall f the gall bl dder hen examined mi
crosc pically s ot in it If an ind cation of flam
mation whe it i not ass ciated with othe igns of
inflammati n and sh ld not be interp eted as s ch

Thes polymorphonuel a leucocyte are ervng
a metabol c f ction rather than an i flammatory
fu ction when not a ocated v ith other signs of
inflammation

The iodized dye us d in th preoper tiv oent
g ograph c v i al zation of the g ll bladder does
n t hav any ass ciat n with the polym ph
nuclear l c cyt s in su gically remo ed specime

Bracletto Bri n D Th Origin and Devel pm n
tal Cy l of the My lopl of B ne Tum s—
B nign Vari ty (On y ci l l t d s
m l pl d l t m es d l hu —
b gn) P m d g t 944 3 2477

Th author h d an ppo t nity to st d the much
d scu s d m y clax f b gn bone tum rs n v eral
specimen ofs ctum fms thow efr e fh mor hage
and signs of egr ssion so th t pa ticul rly cl
p ct es were obtai ed Th hi tolog cal p ctures of
the myeloxplax n the va ious tag of development
ar reproduced

Thes c ll origi ate f om the nucl i of the synce
t m by a p ocess of amitot c d v sion They u d go
a g lar cl sed cycle of development thr ough 3 th
mat rity old ag and death In the you g f rms
th e reg erally fr m 2 to i nuclei lthough the
numbe is les impo ta t than the structu l char c
teristics which a e very s mil r to those of the
n cl i of th synctum In the mat stage th re
m y be as ma y as 100 nucl i alth ough ther may
t b mo e th n 8 or 10 but he e too the n mber
s n t s impo t t as the maturat n sh wn by
cre sed b chromatin As the cells gr w old the
nuclei d cr ase n v lum and their ov id f rm tends
t b c m egul rly polv d l The basich m t

c a es nd co d es and fi lly pyk osi t kes
plac Cells of d fferent stages of maturity may be
fo d in the s m t m This process f mat ra
ti n n th t pecula to h ghly d ffr tated
ll Functi lly the my loplax cts a a osteo
clast th mo t m rk d clin cal character tic f these
t m rs b i g osteol s s l add t on th my l pla
p bably ecretes an enzy m wh ch br g about

pl bomb and inc nd a es About two thirds of the collect ns van sh d in th c nflagration The p nt publication; th H nteri n Orat nd aling with the e ly hist ry of the M se m and with plans fo ts r storat ion and futu e d l pm nt The autho desc bes how H nt r was inspir d t col lect nd how he l arned to b a master in th a t f prep t n the inc pt ion nd gr wth of his collect n h m th d nd fa lte fo w k and h wo k o m The destruction f the M e m p o vided an oppo tun ty nd th nec s ty for its ec n truction and the Museum Committ has p e s nted a pl n f r the f t e wh ch has been a pted by the C uncil d the H nteri n Trustees

Th Mu e m will b rebo n in circumstance d f f nt f m thos wh ch xisted wh n it first cam nto b ing ne hund d and th rty y ars g Then th re w e no the museums d voted to nat my and path l gy wh reas now ll med cal ch ls have m seums S m of th ct vities p ously ca d on n the fild f natu al hist ry and ology can better b m intained by oth r m um

Broadly th conclusions of th Mus um Com mitte are that the museum should be t ed and built up around the surviving ll ct ns to illu t ate the d v l pment struct and fu ct ns f m t gether with the accid nts and dis ases to h ch h

m y be victim with such refe nc to th an m l kingdom as may help to eluc dat the p oblems v lv d On of th first q est ns t be ttld a how t disp s f th survi ing H t rian p epara tions M t fl t u c n n d the Comm tt that e cho e h ld b all cat d t its p p r s c t n of the ge l c ll t ns rath tha to a pe c al m or sh m A t m p ary xhib t t incl d all r ma n n H t sp c m ns and Hunt relics is c nt mpl ted S fa as poss ble destr y d Hunte n sp men with a lesson to teach or gnized lassical p t tally v l ble ho ld be placed In the f t sp c m ns will be ac cept d or ret n d ly b ca of the l Th mu m s to b k pt p t dat by epla ng d t r ted specim ns and by nstantly dd g b tter s these b me ilable Th d a of p e tng p c al b t ch ng g exhib ts s also c templated Th a tho ble es that facilit s sho ld be provid d f r cc d ted es ch wo kers to e am closely ore n dis ct m t al ad that tudy oms mght b p d d here ch w l rs co ld k p the sp c m ns d wo k on th m w th t h g to as emble th r materi l e h d y The e llenc f th new Mu m ill es de n th ho c f m t l ts arr ngem nt a d n ts b ltv J HN L LINDQU r M D

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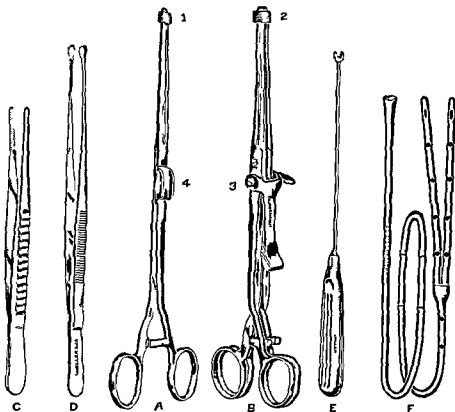
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Instruments for Aseptic Gastric Resection

BY OWEN H WANGENSTEEN MD FACS



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SURGERY

GYNECOLOGY AND OBSTETRICS

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SEPTEMBER 1945

NUMBER 3

THE FALLACY OF SURGICAL GUT (CATGUT) TUBING FLUID AS A TISSUE IRRITANT

JOHN O BOWER M.D. F.A.C.S. Philad lph Penn yl a

IT is estimated that fully 80 per cent of surgeons in America today use catgut exclusively as their suture material and while the remainder use silk or some other nonabsorbable material they usually employ catgut whenever silk is contraindicated. More over in wounds which are or may become contaminated catgut is the overwhelming choice with practically all surgeons.

TISSUE REACTION

The character of cell reaction against any suture where the patient's capacity to respond is within normal limits is identical: an initial polymorphonuclear infiltration is followed by the presence of more mature mononuclear cell and then by fibroblasts. This cell reaction imply an attempt to dissolve, digest, absorb, get rid of something which is not meant to be a part of the human body. The cellular reaction from the time the suture is embedded until its complete disappearance varies little from the reaction of the protective mechanism when combating bacterial invasion. In the case of catgut the reaction is acute and absorption of the strand is rapid in the case of silk or cotton it is prolonged. The initial attempts at removal of nonab-

sorbable sutures are the same as with catgut but in the case of silk the phagocytic cells are confronted with the problem of digesting one of the most resistant fibers. Unable to do otherwise they quarantine the undesirable strand in a capsule of fibroconnective tissue. To epitomize catgut strands plain or chromic silk or cotton twisted or braided all produce cell reactions which are similar in character in the first few days after being embedded in normal tissue. The degree of this reaction however varies with the resistance of the patient and the nature of the suture strand.

In 1940 I presented evidence (2) in the case of catgut which showed that regardless of anything else such as method of processing or the tubing fluid used the quantity of suture material is the chief cause of tissue reaction. Gross and microscopic sections showing the minimal tissue reaction accompanying the embedding of fine size catgut as compared with the larger sizes were presented. The tremendous increase in the use of the smaller sizes of catgut would seem to indicate that surgeons have proved this point to their own satisfaction.

PURPOSE OF INVESTIGATION

Recently the attention of the surgical profession has been directed to the subject of tub-

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ing fluid (4, 5, 6, 7) and the claim has been made that certain fluids are responsible for the rather marked tissue reaction sometimes provoked by surgical gut sutures. Not having encountered tissue reaction of the type described, my interest in sutures prompted a series of animal experiments to procure additional information on the subject of catgut tubing fluid and to establish definitely the part that tubing fluid plays in tissue reaction.

MATERIALS

In the experimental work reported by Dunham and Jenkins (4, 6) it was stated that the amount of water insoluble hydrocarbon (hi flash solvent) present in alcoholic tubing fluid of most nonboilable surgical gut products has ranged from a trace up to as high as 10 per cent in some products while in one product it ranged from 6 to 14 per cent. Through the cooperation of one of the larger catgut manufacturers a series of nonboilable catgut sutures was prepared, tubed in ethyl alcohol containing percentages of hi flash solvent ranging from 0.1 per cent up through 1 per cent, 2.5 per cent, 4 per cent, 10 per cent and 15 per cent.

The suture material consisted of medium chromic catgut size No. 000 which is relatively small and therefore the possibility of tissue reaction caused by a large amount of foreign protein was eliminated. Dunham and Jenkins (4, 6) used this size in their experiments and further medium chromic catgut was used in order to minimize tissue reaction caused by the suture material itself, inasmuch as Bates (1) has demonstrated that plain catgut excites a greater exudative response in the tissue than does medium chromic catgut.

SPECIES OF ANIMALS

Series I. Fifteen rabbits and a similar number of dogs were used. The rabbits were of more than 4 pound average weight. Dogs were used also because their tissue reaction to sutures and the anatomical structure of their stomach closely resemble that of man. In a dog weighing 44 pounds the stomach is similar in structure, blood supply and acid content to that of man. Vitamin metabolic and blood studies were conducted on the dogs

for a period of approximately 2 months at the end of which time the animals were divided into three groups.

Group 1. This group was composed of healthy dogs that had received a balanced diet with hemoglobin content, erythrocyte and leucocyte count, blood chemistry, vitamin C content and kidney function within normal limits. Their average weight was 25 pounds.

Group 2. In this group were dogs with a reduced blood volume but still healthy, average weight being 33 pounds. They had received a balanced diet, hemoglobin and vitamin C content, erythrocyte and leucocyte count, blood chemistry and kidney function had been determined. Anesthesia was induced by the intraperitoneal injection of sodium pentobarbital. The internal jugular vein was cannulized and enough blood was removed to reduce the blood pressure to 70 millimeters of mercury. This blood pressure was maintained for 30 minutes by the withdrawal when necessary of a sufficient amount of blood. A special colloidal solution of hemoglobin was then injected in sufficient quantity to bring the blood pressure to within prehemorrhage level and the studies made prior to operation were repeated. The animals were then permitted to recover and at varying periods of time blood studies were repeated.

In some of these animals sutures were implanted within a few days after blood replacement. While they had recovered from shock, their total hemoglobin, as well as the red cell count, was reduced, the vitamin C content, however, was within normal limits. The results of the implantation of No. 000 chromic catgut are shown in Figure 3 and 4.

Group 3. In this group were dogs in a state of malnutrition. Some had been operated on previously. Despite the fact that an attempt was made to improve their physical state, their appetites were not good and they had continued to lose weight which averaged 10 pounds at operation. Their hemoglobin content, erythrocyte and leucocyte count were about 50 per cent of normal and the vitamin C content had been reduced 25 per cent.

The results of implantation of No. 000 chromic sutures in the stomachs of these dogs

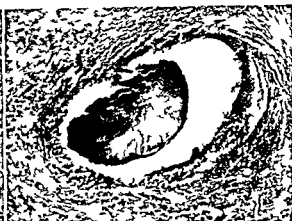


Fig. 1. Section of tissue showing a central dark area surrounded by a lighter, irregular ring, with a textured outer boundary. Magnification: $\times 60$.

Fig. 2. Section of tissue showing a central dark area surrounded by a lighter, irregular ring, with a textured outer boundary. Magnification: $\times 60$.

are shown in Figures 1 and 2. Five days specimens were selected because of the maximal tissue reaction usually present at this time.

EXPERIMENTAL METHODS

Series 1. The rabbits were anesthetized by intravenous sodium pentobarbital. Aseptic technique was used. Midvertical epigastric incisions were made. The sutures saturated with the tubing fluid were embedded beneath

the serosa of the anterior gastric wall immediately after removal from the glass tubes. As a control, I used medium chromic catgut sutures tubed in ethyl alcohol from which all trace of alcohol solvent was removed. The animals were sacrificed on the 5th, 10th, and 20th days, and blocks of tissue were removed.

Microscopic examination showed a minimal degree of tissue reaction in all animals. The degree of tissue reaction produced by sutures

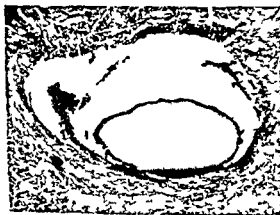
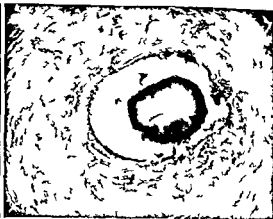


Fig. 3. Section of tissue showing a central dark area surrounded by a lighter, irregular ring, with a textured outer boundary. Magnification: $\times 60$.

Fig. 4. Section of tissue showing a central dark area surrounded by a lighter, irregular ring, with a textured outer boundary. Magnification: $\times 60$.



F 6 N m l d T ta h m catgut
 N ooo m ed f m t m h t h d f d y
 Th t h d b t bed thyl l h l f m huch ll
 tr f h fl h sol t h d be m ed L ocyti
 hlt ti m k d-d or f fib les th F gu
 6 X3

F 6 N m l d g T es t g h t gut
 N ooo m ed f m t m h t h d f d y
 Th t h d b t bed thyl l h l t t
 pe t f h fl h sol t L ocyt f l t t th
 p m m m m l-fib bl t espo ll t
 X60

which had been in tubing fluids containing varying degrees of hi flash solvent was no greater than that caused by the control sutures tubed in alcohol from which all trace of the solvent had been removed.

Based on the results of these experiments it seemed as if some other factors not taken into consideration might account for the difference in these results as compared with those reported by Dunham and Jenkins (4, 6). Therefore it was decided to conduct a second series of experiments using a similar set of sutures and tubing fluid.

Series For this second series of experiments however dogs were used exclusively for the reasons stated. Moreover in the experiments reported by Dunham and Jenkins dog were employed. In order to remove all possible factors which might account for the difference in results between their experiments and mine dog were elected on which vitamin metabolic and blood studies had been conducted so that each animal's physical condition was known. Ether anaesthesia was employed. The abdomen of each animal was prepared by shaving and washing with alcohol. Aseptic technique was used throughout. A midvertical epigastric incision was made the edges of the incision were protected with sterile drape and the dog's stomach was delivered. The sutures to be tested were placed

vertically beneath the serosa in the anterior gastric wall immediately after removal from the glass tubes so that the sutures were saturated with the tubing fluid and exposed to the air less than 1 minute. Both ends of the suture were marked with a single interrupted black silk suture. The animals were given water at the end of 24 hours soft mash in moderate quantity at the end of 48 hours and regular diet after 72 hours. The wound healed normally without exception. The animal was sacrificed on the 5th, 10th and 20th days and sections of the stomach were removed for microscopic study. At autopsy the gross appearance of all the dogs' stomachs was similar.

DISCUSSION

Experimental work (2, 3) reported in 1940 and 1942 gave an accurate estimate of the comparative degree of tissue reaction following the embedding of catgut strands of varying character and it proved the value of a study of the gross and microscopic changes. It can be assumed that the mechanism designed to dispose of the foreign body (suture) would of necessity first attack the exterior coating which in this instance would be the tubing fluid and that the degradation action once begun would continue until completed.

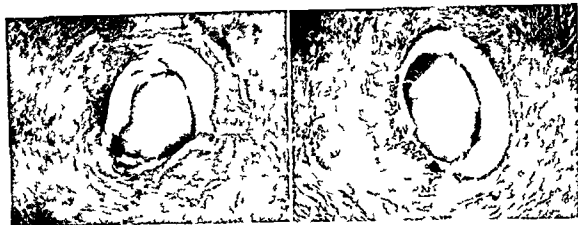


Fig. 7. m. l. d. g. T. s. t. g. h. m. t. g. t.
 \ ooo m. e. d. f. t. h. t. h. t. h. t. d. f.
 d. y. Th. t. h. d. b. e. t. b. e. d. t. h. y. l. h. l. t.
 g. 4. p. e. t. f. h. f. l. a. h. s. o. l. t. L. e. o. c. y. t. f. h. t.
 m. l. F. b. b. l. t. e. q. s. e. s. a. t. f. t. r. y. X60

Fig. 8. m. l. d. g. T. s. t. g. h. m. t. g. t.
 \ ooo m. e. d. f. t. h. t. h. t. h. t. d. f.
 d. y. Th. t. h. d. b. e. t. b. e. d. t. h. y. l. h. l. t.
 g. 4. p. e. t. f. h. f. l. a. h. s. o. l. t. L. e. o. c. y. t. f. h. t.
 n. m. l. F. b. b. l. t. p. o. c. l. l. t. X60

A review of the microscopic changes observed in the accompanying photomicrograph shows that this actually occurs. Polymorphonuclear infiltration occurs first and is greatest in the 5 day specimen regardless of whether his flash solvent was present in the tubing fluid—in fact it is greatest in those specimens containing the control sutures whose tubing fluid did not contain any his flash solvent (Fig. 1).

In 10 day specimens the tissue reaction was consistently less than in the 5 day specimens regardless of the amount of his flash solvent in the tubing fluid. In the 20 day specimen the tissue reaction was still less than in the 10 day specimens.

These results lend no basis whatever to the claim made by Dunham and Jenkins. The magnitude of irritant action which in some respects was rather excessive was proportional to the amount of water in soluble liquid (his flash solvent) in the alcoholic tubing fluid. As already mentioned the tissue reaction was not related to the amount of his flash solvent in the tubing fluid. In fact the minimal degree of tissue reaction occurred with sutures tubed in ethyl alcohol which contained a high percentage of his flash solvent (Fig. 8).

If then the tubing fluid is not the cause of the intense tissue reaction described by Dunham and Jenkins (4, 6) what is? If the tubing

fluid has been absorbed and disposed of early then the only material remaining which could call out a leucocytic response of such intensity is the catgut strand itself and the chemicals which were incorporated in it during the processing.

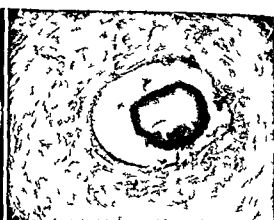
As previously mentioned whether it be catgut silk or cotton leucocytes attack the suture and attempt to dispose of it as long as it remains in the body. Figures 15 and 16 show cross sections of size No. 0 silk tubed in xylene which were removed from rabbits at the end of 14 days. The low power lens (X60) shows absence of leucocytic infiltration at the periphery. The high power (X260) shows leucocytes surrounding the individual fibers. This is further evidence that the strand itself and not the tubing fluid is the cause of the tissue reaction.

The microscopic sections are presented in three groups. Group 1 normal dog 10 day and 20 day. Group 2 convalescent partially exsanguinated dogs—similar to patient operated on in shock that ectopic pregnancy or bleeding duodenal ulcer 10 day and 20 day. Group 3 scorbutic dogs 5 day and 10 day.

The first two groups of photomicrographs show very little difference in tissue reaction. The tissues of most animals and this includes man as well as the dog heal normally in the presence of a reduced blood volume. Photo



F N m l d g T t g h m t g t
 \ o o o w s m d f m t m h t t h e d f d y
 Th t h d b t b d thyl ! h l f m h h l l
 t f h f l h s l t h d b m d L cyt
 f l t i m l d - d g f f b j th F gu
 6 X 3



F g 6 \ m a l d g T t g h m t g t
 \ o o o a m d f r m t m h t t h d f d y
 Th t h d b t b d thyl ! h l t g y
 p c t f h f l h l t L cyt f l t t th
 p m m a l - f l b l t i t
 X 6

which had been in tubing fluids containing varying degrees of hydroalcoholic solvent was no greater than that caused by the control sutures tubed in alcohol from which all trace of the solvent had been removed.

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Fig 7 \ 1 d g T t g h catg t
 \ 000 ed f m th t m h t th d f
 d ys Th t h d be t bel thyl l h l ta
 g 4 pe t f h fl a h sol t L ocyt flt t
 l b b l t r rponse t f t y X60

Fig 8 \ 1 d g T t g h t g t
 \ 000 r m ed f m th t h t th d f
 d ys Th t h d b t bed thyl l h l t
 g pe t f h fl a h sol t L ocyt flt t
 l F b bl t r rpo c ll t X60

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I 9 \ m l d T a s t a g h t g u t
N o o w m d f m t h a t h d f
d y s T h t h a d b e e t b d t h y l l h l f m
h c h l l t r a f h f l h s o l t h d b r m d
L e o c y t f i l t m m l F b b l t f r m t
w l l d w e d X 6 0



F g \ m l d T m t h c t o u t
N o o w m d f m t h t h t h d f
d y The t h d b t b e d t h y l l h l f
g p e t f h f l h l t L y t f l t
b s t F b o b l t f r t d d t h
F g u 9 X 6 0

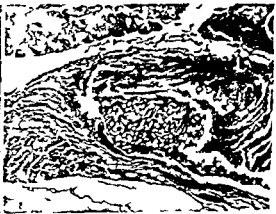
micrographs of both 10 day and 0 day specimens show this clearly the degree of tissue reaction and absorption of the strand are almost identical. In the third group the scorbutic dogs the 10 day specimen shows very little difference from that of the normal animal.

The photomicrographs are presented with a low magnification because examination of the entire section is necessary to draw any accurate conclusions.

Ethyl and isopropyl alcohols There is a very pertinent matter mentioned by Dunham and Jenkins (4) concerning the nature of the alcoholic tubing fluid. They reported that some manufacturers employ tubin fluid containing isopropyl alcohol for nonboilable surgical gut while others use ethyl alcohol. It seemed important in this study to investigate these two alcohols for use as tubin fluid. A third series of animal experiments were carried out in which cotton sutures sterilized



F g C t t d \ t b d t h y l l h l
p l d b e t h o f b b t t m h d e c t m t b e
t b f l u d t h l f f T a s t t i o n
t d m d f t j d y s L o c y t f i l t b
s e t X 6 0



I t C t l \ t b e d c o n p l
t t p l d b e t h s a f l b t t h d e c t
f o m t e t b f l u d t h l f f l t g
t t d X 6 0 t f t j y M l t l y



Fig. 3. Ch. m. t. gut. N. o. o. t. bed. yl. l. ed. be. t. l. g. fl. l. t. hed. fl. T. ta. g. t. g. t. t. d. m. l. ft. 5 d. 3. I. ocyt. flt. t. l. X60.

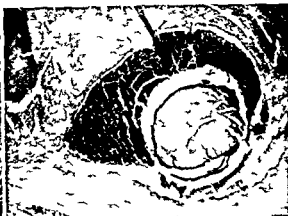


Fig. 4. Ch. m. t. gut. N. o. o. t. liz. d. d. y. th. t. t. b. g. fl. d. pl. ced. be. th. s. r. sa. f. bl. t. t. h. Ti. ta. g. t. g. t. st. l. m. d. aft. 5. l. ys. Ie. ocyt. filtrat. n. k. l. beg. s. b. r. ft. l. t. d. X60.

in each of these alcohol were used to determine the effect of each.

Series 3. Fifteen rabbits were used. The average weight of the animal was over 4 1/2 pounds. Anesthesia was induced by intravenous sodium pentobarbital. Aseptic technique was used throughout. The sutures were embedded in the anterior abdominal wall beneath the sheath of the rectus muscles immediately after removal from the tubes so that they were still saturated with the tubing fluid. The animals were sacrificed at intervals of 1, 3, and 5 days and microscopic

studies of blocks of tissue showed that the degree of tissue reaction induced by the sutures tubed in isopropyl alcohol was at least twice as great as that produced by the sutures tubed in ethyl alcohol (Figs. 11 and 12).

Xylene tubing fluid. Dunham and Jenkins (4) reported that xylene used as a tubing fluid for the boilable type of surgical gut is a potent tissue irritant and in some tissues becomes a necrosing agent. They stated that if manufacturers are unable to provide an anhydrous liquid for boilable surgical gut which is harmless to tissues it would appear appropriate



Fig. 5. Ch. m. t. gut. N. o. o. t. bed. yl. Lm. flt. t. f. f. b. r. s. th. l. ocyt. X60. F. h. res. 5. d. t. ca. sed. by. silk. tra. j. t. y. l. t. l. g. t. l.



Fig. 6. H. gh. po. m. gn. f. ti. f. F. gut. N. t. flt. t. f. f. b. r. s. th. l. ocyt. X60. F. h. res. 5. d. t. ca. sed. by. silk. tra. j. t. y. l. t. l. g. t. l.

to suggest marketing boilable products without any tubing fluid. For the purpose of comparing the reactions produced by surgical gut tubed in xylene and surgical gut sealed in tubes without any tubing fluid I conducted a fourth series of animal experiments. Medium chromic catgut size No. 000 was used, some of the sutures being tubed in xylene and sterilized after the usual manner of preparing boilable surgical gut while the remaining suture were placed in dry tubes the tubes sealed and sterilized.

Series 4. Thirty healthy rabbits whose average weight was over $4\frac{1}{2}$ pounds were used for the tests. Anesthesia was induced by intravenous sodium pentobarbital and aptic technique used throughout. Midvertical epigastric incisions were made and the sutures embedded beneath the gastric serosa. In one group of animal the sutures were embedded in the tissues directly as they came from the glass tubes so that the sutures tubed in xylene carried the anhydrous liquid directly into the tissues. In the other group of animal the sutures were first immersed in warm sterile water before being embedded in the tissues so that the xylene on the surface of the strand was removed. This procedure also served to soften the dry sterilized suture and thus lessen tissue trauma. The animal were sacrificed on the 1st, 3d and 5th days and blocks of tissue were removed for microscopic examination.

A study of the specimens showed that in both groups of animal the degree of tissue reaction as shown by polymorphonuclear infiltration was from 50 per cent to 300 per cent greater around the sutures that were sterilized dry in the tube than around the sutures that were tubed in xylene (Figs. 13 and 14). The explanation of these results lies in the fact that when sutures are sterilized dry a small quantity of a mixture of fat and fatty acid remains in the suture and acts as a tissue irritant. However when the sutures are sterilized in xylene this hydrocarbon extracts this mixture of fat and fatty acid and the fatty extract remains in the tubing fluid in the tube. From this series of experiments it is clearly evident that xylene as a tubing fluid does not produce tissue irritation. Like-

wise it is equally evident that it is not practical to market boilable surgical gut dry because of the excessive degree of tissue irritation induced by dry sterilized gut.

To further investigate the possible irritant effect of xylene on the tissues I conducted a fifth series of animal experiments.

Series 5. Three rabbits each weighing over $4\frac{1}{2}$ pounds were used. Each was anesthetized by means of intravenous sodium pentobarbital. The abdomen was shaved and prepared aseptically and a midvertical epigastric incision was made. To the stomach with attached omentum and the contiguous small and large intestines pure xylene was liberally applied by means of sterile cotton swabs. The incision was then closed. The animal were sacrificed on the 3d postoperative day. All 3 showed complete absence of tissue irritation—there was no free peritoneal fluid, no dilatation of the superficial vessels, no adhesions. The accompanying reproduction in colors was made from a photograph taken after the autopsy.

CONCLUSIONS

1. The animal experiments herein reported. Series 1 and 2 demonstrate that nonboilable catgut tubing fluid consisting of 95 per cent ethyl alcohol containing various percentages of hi flash solvent does not produce excessive tissue reaction (Fig. 2, 4, 6, 7, 8).

2. Regardless of whether or not hi flash solvent was present in the tubing fluid tissue reaction is most marked in the 5th day specimens. In fact the reaction is greatest in those specimens containing control suture the tubing fluid of which did not contain hi flash solvent (Figs. 1 and 2).

3. These results lend no basis to the published claim of other (4) that the magnitude of irritant action which in some proportions was rather excessive was proportional to the amount of water insoluble liquid (hi flash solvent) in the alcoholic tubing fluid. The results herein recorded show that tissue reaction is not related to the amount of hi flash solvent in the tubing fluid.

4. In Series 3 it has been shown that the degree of tissue reaction induced by catgut suture tubed in isopropyl alcohol at least

THECA CELL TUMORS OF THE OVARY

A Clinical and Pathologic Study of Twenty Three Cases (Including Thirteen New Cases) with a Review

EDWARD A BANNER M D d MALCOLM B DOCKERTY M D R heste M e ot

HISTORICAL DATA

Inasmuch as all major articles dealing with the subject of theca cell tumors have devoted considerable attention to historical aspects we wish to treat this phase of the subject in the light of more recent advances only. Geit and Spielman in 1935 (11) using an extract of tumor tissue confirmed the clinical observation of Melnick and Kanter (19) that theca cell tumors sometimes contain estrogenic substance in considerable amounts. Others have confirmed this observation and Traut and Butterworth (4) expressed the opinion that even though the amount of estrogenic hormone might be small its effect on the endometrium and on the breast might well be maximal because of an unopposed hormonal action inasmuch as absence of corpora lutea and presumably of progesterone has been constantly observed among patients suffering from the effects of theca cell tumors. More or less periodic postmenopausal bleeding in old women who had these neoplasms and the association observed at pathologic examination of proliferative or polypoid endometrium and fibromyomas were adduced as strong supportive evidence for hyperestrogenism. Similarly interpreted was the occurrence of oligomenorrhea or amenorrhea observed in occasional cases in which theca cell tumors affected younger women. Even more suggestive was the evidence cited by Kirshbaum and others (5, 9, 23) that theca cell tumor like its close relative the granulosa cell neoplasm is sometime associated with endometrial carcinoma.

Although theca cell tumors were originally considered as luteinized fibromas—(xanthofibromas (16) and later as arising from mature theca cell of the ovarian follicle () most investigators now feel with Fischel that these

DURING the decade that has elapsed since Loeffler and Prieel (16, 17) gave the first accurate description of the ovarian neoplasm now variously known as thecoma or theca cell tumor many examples of this gynecologic newcomer have been added to the medical literature (-6, 10, 14, 19, 20). From the many excellent reviews on the subject the following observations seem pertinent: (1) Theca cell tumor of the ovary is an established entity. (2) The tumor often produces estrogen sometimes in amounts capable of influencing profoundly the physiologic processes of its host. (3) The tumor probably derives its origin from certain pluripotential mesenchymal cells of the ovarian cortex and is related on the one hand to the histologically mature fibroma and on the other to the comparatively dedifferentiated granulosa cell neoplasm. Controversy still exists however in regard to certain clinical pathologic and physiologic aspects of the tumor and further statistical data are necessary to elucidate some of the issues. In the present report we hope to furnish some of these data in an analysis of 23 cases of theca cell tumor seen and studied at the Mayo Clinic between the year 1910 and 1944 inclusive. Ten of these cases have been previously reported by one of us (Dockerty, 5) but these cases have been reexamined in the light of recent observations in staining reactions and of chemical assays of lipid substance as applied to theca cell tumors of the ovary.

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F d t d th S S cal P h l gy M y Cl
Ab d m t f hes b m d by D B h F cul
f h Grad S hool f m Uni t f Minnesota p tual
f d fillm f th q m f th d or f M S Ob
t cs d G n l gy en D B ha t ed h rmed
serv es d w L tenan M C Army f h l ed

tumors spring from ovarian cortical mesenchyma. This hypothesis has had positive support in the experimental work of Furth and Butterworth and of Geitl, Gaines and Lollack (12) who through the employment of roentgen rays were able in mice to produce both granulosa cell and theca cell tumors of the ovary. Both types appeared to have mesenchyma as their tissue of origin. This work explained among other things the strange microscopic picture of certain tumors described by various investigators who noted what seemed to be an admixture of granulosa cell and theca cell elements in the same tumor. Novak (12) went so far as to state that no distinction should be made between the two types and he suggested the term "feminizing mesenchymoma" to designate both. Inasmuch however as granulosa cell tumor sometimes occurs among children whereas no theca cell neoplasm has been described as occurring in the first decade of life, most investigators favor supporting the concept that the two tumors are distinct entities.

In matters of differential diagnosis by histologic methods, techniques employing the principle of silver impregnation have highlighted recent developments. According to Wolfe and Verus (25) formation of reticulum by the theca cell is an important distinguishing feature since granulosa cell tumors apparently do not elaborate this substance. Others have reported results which are at variance with these observations and have turned for the solution of the problem to chemical and histochemical methods for determination of lipid fractions of the tumor. In question Greenblatt, Greenhill and Brown (13) found that qualitative and quantitative assays of theca cell tumors yielded values for lipid substances which were different from the corresponding values for these substances when studied from such tumors as granulosa cell neoplasm, dysgerminoma, Krukenberg tumors and ovarian fibroma. This recent phase of the problem needs further investigation.

MATERIAL AND METHODS

The material for the present study was selected from a group of more than 600 solid and semi-solid ovarian tumors seen in the division



Fig. 1. Theca cell tumor. (H. E. stain, 100X). (Theca cell tumor, 100X).

of surgical pathology and the section on pathologic anatomy of the Mayo Clinic between the years 1910 and 1944 inclusive. All of the material used in the study had been preserved in a 10 per cent solution of formalin (4 per cent formaldehyde).

The method of approach consisted essentially of a sorting out process chiefly concerned in the beginning with certain neoplasms which had been labeled fibromas (7). Whenever any tumor was encountered which grossly or microscopically resembled the theca cell type this neoplasm was considered as a potential candidate for inclusion in the study and was further investigated. This special treatment consisted in a thorough review of the gross specimen with special reference to the shape, size, weight, color and consistency of the ovarian tumor and in examination of the contralateral ovary for signs of cessation of function as evidenced by absence of follicles and of corpora lutea, presence of atrophy with fibrosis and so forth. In those cases in which hysterectomy had already been performed careful notations were made as to the weight of the uterus, the thickness of the myometrium, the presence or absence of myomas, the thickness of the endometrium and finally the results of careful search for evidence of endometrial carcinoma. Multiple blocks of tissue were cut in each instance from the ovarian

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Fig. 1. Theca cell tumor (left) and granulosa cell tumor (right) showing theca cell type (left) and granulosa cell type (right). (H&E, 100X)

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Fig 3

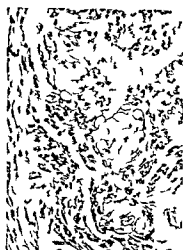


Fig 3



Fig 4

F Thec ll t m h g m h tra ll l lp-
d ppe n g d k gra les w th p dl ll (d
III X 33)
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h Fgu Th d o ca th m gr d m

t ta d d th f th d th f th p t t
(h m t yl d os X 33)
Fg 4 d oca g d f th f l t th
thee ll t m f th ry (h m t yl l os
X 37)

tumor the contralateral ovary and the endometrium. These blocks were transferred to bottles containing a fresh 10 per cent solution of formalin, sectioned both by the freezing and by the paraffin method and stained routinely with hematoxylin and eosin with sudan III and also with various reticulum stains the principle of impregnation with silver being used. In all 23 cases seemed to satisfy the histologic criteria necessary for a diagnosis of theca cell tumor.

In 8 of the 23 cases mentioned weighed amounts of tumor tissue were sent to the division of biochemistry where analyses were carried out on the various lipid fractions (Table I). By way of control (Table II) 7 normal ovaries were similarly analyzed chemically after careful removal by dissection of all gross luteal tissue which if included might nullify the value of the comparison by its high content of lipid.

Unfortunately we did not encounter during the course of the study any patients for whom a diagnosis of theca cell tumor had been made preoperatively. Consequently we were unable to perform any preoperative determinations for estrogen on the urine of patients who had this type of tumor. In one

instance however postoperative studies of estrogen were made on the urine as well as on the fresh tumor tissue of a patient from whom a theca cell tumor had been removed.

Clinical record of these patients were then secured and studied for pertinent data especially as regard menstrual irregularities of the younger patients and postmenopausal bleeding in the older group. These data were carefully recorded. The following paragraphs deal in somewhat abbreviated form with our findings in 3 cases of theca cell tumor of the ovary.

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he laboratory Al m nary passage b m t g n d he
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CLINICAL OBSERVATIONS

Incidence In our series theca cell tumor appeared to be relatively rare. It comprised about 3 per cent of the group of solid ovarian tumors, was about a third as common as granulosa cell tumor and was less than a tenth as common as ovarian fibroma.

Age The average age of patients who had theca cell tumors was about 54 years. Sixty-five per cent of the patients were 50 years of age or older. Extremes of 80 and 6 years were noted. In the literature theca cell tumors have not been reported as occurring prior to the age of puberty.

Parity Pregnancy had occurred at least once in 80 per cent of the patients.

Symptoms Irregular vaginal bleeding of the postmenopausal type or gross menstrual irregularities of younger patients existed in more than 60 per cent of the reviewed cases. Of 6 patients less than 45 years of age, 2 had experienced amenorrhea of $4\frac{1}{2}$ months and 1 year respectively; one had experienced menometrorrhagia for 3 months while the remaining three had not noted any change in their menstrual rhythm. Of 12 patients 55 years of age or older, 8 had complained of postmenopausal spotting for periods varying from 10 days to 10 years. No menstrual aberrations had been recorded in 4 cases. Postmenopausal bleeding was noted in the records of 2 of the remaining 5 patients of menopausal age. In 3 cases it was impossible to ascertain whether or not the theca cell tumor had produced early amenorrhea or a delay in the onset of the climacterium. In only 1 case of the entire group did the postmenopausal bleeding assume the regularity of rhythm resembling normal menstruation.

The data in this case were briefly as follows:

The patient was 56½ years old, married, and at the age of 50 years she had experienced amenorrhea, hot flashes, nervousness, headaches, and flushing. She had been on hormone therapy for 1½ years. At the age of 52 years these menopausal symptoms had abated, but she was noted to have had a delay in the onset of the climacterium. On admission she had experienced vaginal spotting which gradually increased in amount and assumed a rhythmic character similar to those of her premenstrual periods.

TABLE I—CHEMICAL COMPOSITION OF THECA CELL TUMORS

Endometrial tissue	Cholesterol	Cholesterol	Lecithin	Fatty acids	Total lipids
Adenocarcinoma	8			50	3.3
Hyperplastic (proliferative)		6		6	3.6
Hyperplastic (cystic)		6	77	6	6
Infected	7	4	6	4	
Adenocarcinoma			8		7
Atheroma					6
Infected		3	5	1	3
Percentage of total	7	4	6	4	

The bleeding occurred once a month, lasted from 3 to 5 days and was accompanied by moderate degree of discomfort in the lower part of the abdomen. The patient stated that between periods she felt stronger than she had felt for years and that she could participate in activities which up to this time of life she had found too strenuous.

Physical examination at the clinic revealed a woman very well preserved for 56 years of age. The essential findings otherwise consisted of the presence of an egg-sized tumor in the left adnexal region and an enlarged uterus containing several nodules believed to be fibromas.

Preliminary dilatation and curettage were done with the removal of a large amount of endometrium. Microscopically this presented the picture of moderate proliferative and secretory phases of the menstrual cycle along with moderate cystic change. The uterus, both tubes, and both ovaries were subsequently examined. The cause of a solid yellowish tumor in the right ovary and uterine fibromas. Section made at the time of operation revealed the ovarian tumor to be of the theca cell type and accordingly postoperative studies for estrogen were carried out.

TABLE II—CHEMICAL COMPOSITION OF THECA CELL TUMORS OF NORMAL OVARY

A	Cholesterol	Cholesterol	Lecithin	Fatty acids	Total lipids
5	3	Trac	3.9	.38	
	8	Trac		.00	8
		Trac	3		3.8
	4	Trac	3.00		.47
60		T	50		3
33	36	3	4.3	7	4.43
5		Trac	56	70	

complaints that were not compatible with the presence of any slowly growing pelvic tumor. However a triad of symptoms namely menstrual disturbances pelvic pain and pelvic tumor were observed to occur fairly constantly (Table III). Semiperiodic postmenopausal bleeding appeared to be the only reasonably specific symptom from a clinical standpoint.

Positive findings on physical examination were limited for the most part to the demonstration of a firm adnexal tumor and the frequent association of uterine leiomyomas or of an enlarged uterus. In 1 case a cervical carcinoma was visualized on speculum examination and in 2 cases carcinoma of the fundus was suspected on the basis of a clinical history of regular postmenopausal bleeding combined with the finding on bimanual pelvic examination of a boggy uterus. In one case the presence of a citic fluid was ascertained clinically. No mammary hypertrophy of notable degree was observed in any of the cases in our study.

PATHOLOGIC DATA

Site. The right ovary was the seat of the tumor in 15 and the left in 8 cases. No instance of bilateral tumor was encountered in the series.

Size. The largest tumor measured 12 centimeters in its greatest diameter and the smallest 3 millimeters. The average diameter was about 6 centimeters, the actual size of the tumor bearing no apparent direct relation to the degree of clinical function as measured by the duration or the severity of associated menstrual disturbances.

Color consistency and so forth. The color of the tumors varied considerably. The outer aspect usually smooth and often bosselated presented tints ranging from brownish gray or even pearly to a dull orange yellow. This latter color was nearly always apparent somewhere in cut section of the tumor. The consistency was in general firm but rubbery rather than densely hard and inelastic. Degenerative central cysts were present in several of the larger tumors and these cysts appeared to arise through chronic infarction and edema as the result of twisting of the pedicle of the tumor.

Residual ovarian tissue could be found in the capsules of all but the larger neoplasms. A smooth glistening capsule invested all but two of the tumors and these two appeared to be fixed by adhesions to neighboring structures. Ascites was produced by one large theca cell tumor and its presence was interpreted in the light of weeping edema as postulated for similar findings associated with ovarian fibroma. (7) No examples of Meigs's syndrome were encountered.

Microscopic features. The histologic features of theca cell tumor as seen in frozen and paraffin sections stained with hematoxylin and eosin are well known and in our typical cases there was nothing new to add. In 4 cases examination of the tumor while for the most part revealing ordinary theca cells demonstrated in many areas the cytologic characteristics and cellular arrangement of granulosa cell neoplasm. One of these has been illustrated in a previous article by one of us (Dockerty 5). In these preparations employment of the principle of silver impregnation for the demonstration of reticulum fibrils revealed the presence of these fibrils (Fig. 1) around the theca cells but usually not around the granulosa elements. We were not entirely convinced that the method could be solely depended on as the basis for the differential diagnosis between granulosa cell tumor and theca cell tumor in doubtful cases. Stains for intracellular and extracellular lipid substance were interpreted as giving positive results in all the tumors in the series (Fig. 2). Differential staining for the various lipid fractions as suggested by Wolfe and Neigus was tried but the results were difficult of interpretation. Results of chemical analysis for tumor lipoids are discussed and tabulated in subsequent sections.

Contralateral ovary. The contralateral ovary was available for study in the 2 cases in which necropsy was performed and in 19 of the 21 cases in which operation had been performed. Of these 21 ovaries 20 were somewhat atrophic and 1 was the seat of a benign multilocular cystadenoma. In the 2 instances in which the surgeon preserved one ovary no special notes were made with reference to its condition. Mature or developing corpora lu-

tea were not observed in any instance. However, this was perhaps not surprising inasmuch as many of the patients had already passed the menopause.

Condition of the uterus. The uterus was available for study in 21 of the 23 cases. Conceding that 100 grams represent the average weight of a premenopausal and 80 grams that of a postmenopausal uterus, we can state that in 2 instances the uterus was considerably enlarged as a result of myohypertrophy (190 grams in 1 patient who was 70 years of age). In an additional 6 cases there were myohypertrophy and single or multiple fibromyomas. In 7 other cases fibromyomas so distorted the uterus that no conclusion could be drawn as to the presence or absence of myohypertrophy. Enlargement of the uterus associated with endometrial carcinoma was observed three times; an essentially normal size was seen twice and true atrophy noted in one instance. Since myohypertrophy and uterine leiomyomas can be experimentally produced in animals by the use of estrogenic stimulation, the foregoing observations would lend some support to the thesis that at least some of our theca cell tumors were elaborating estrogenic hormone.

The endometrium in these 21 cases presented the following features of interest. In 14 cases the endometrial lining was grossly thicker than normal and in 12 cases microscopic examination revealed the picture of early or late proliferative phase of the menstrual cycle, usually with addition of cystic change. (In 2 cases the endometrium showed the picture of secretory change.) Eight of the 14 patients were in the postmenopausal age group. (Although it is well known that normally the endometrium does not become atrophic immediately after the clinical cessation of menses, we take the finding of such thick endometrial lining in some of our patients who were more than 60 years of age as fair evidence of estrogenic stimulation.) One patient had adenocarcinoma grade (Broders method) of the cervix and atrophic endometrium. Two other postmenopausal patients, one with no history of bleeding, also presented the picture of endometrial atrophy. Concomitant uterine carcinoma was found in 4 cases of theca cell

tumor in addition to the one cited in the foregoing. In 1 of these cases the tumor was adenocarcinoma grade 2—Broders (Fig. 3) of the cervix (Case 17) which produced death from widespread metastasis. In the 3 remaining cases there was adenocarcinoma of the uterine fundus without evidence of metastasis at the time of operation (Fig. 4). Thus 22 per cent of our patients with theca cell tumor had associated carcinoma of the uterus. Since this complication was not encountered in any patient less than 50 years of age, the incidence of the association was 33 per cent for the group of older women. The carcinogenic influence of estrin is accordingly to be at least considered in these cases in which uterine malignant lesions are present (Table III).

CHEMICAL STUDIES

In the differential diagnosis between granulosa cell tumor, theca cell tumor, fibroma and so forth, Greenblatt, Greenhill and Brown have employed chemical analysis of various lipid fractions of tumor tissue. These authors expressed the opinion that functioning tumors such as granulosa cell and theca cell neoplasms contain more phospholipid and cholesterol than do the nonfunctioning tumors such as for example fibroma. They further expressed the belief that theca cell tumors contain more cholesterol than is found in granulosa cell tumors.

In the present series the chemical analyses suggested by Greenblatt, Greenhill and Brown were carried out on portions of theca cell tumors not selected at random but chosen from cases which presented varied endometrial pictures (Table I). Also by way of comparison along a line not hitherto approached, similar analyses were carried out on portions of presumably normal ovaries removed for various reasons in the course of pelvic operations. These ovaries were selected from patients of different age groups. The sections were taken from portions of the ovaries in which no old or recent corpora lutea were present and for the most part

If those who end have the carcinoma described below, compare with theca cell and granulosa cell tumors. Examples of typical hyperplasia (so called carcinoid hyperplasia) of the endometrium below. Case 1, our series, is of extreme importance as (1) it is one of several cases of granulosa cell tumors associated with endometrial carcinoma, and (2) it is the only case of carcinoma of the ovary with a reparative

represented ovarian cortical stromal tissues (Table II)

Results of both these chemical analyses were somewhat disappointing inasmuch as they did not show any striking correlation to exist between tumors having similar histologic structures and presumably similar embryologic backgrounds. In general the total lipid content of the tumors was found to be moderately elevated above that of normal ovaries (if we except the one specimen of the latter which contained 4.43 per cent of lipid substance). Individual values for lecithin and fatty acids did not appear to have differential significance. However cholesterol and cholesterol esters were present in definitely increased amounts as compared with the normal ovarian stroma with phospholipid levels somewhat lower.

FOLLOW UP STUDIES ON PATIENTS

Adequate follow up studies were made on 20 traced patients. There was in this group no instance in which the patient had died as a result of a malignant process beginning in a theca cell tumor. One patient died as a result of generalized metastasis from a cervical carcinoma as previously noted. Five additional patients died from causes apparently unrelated to their ovarian tumors. 0, 12, 5, 4, and 1 year postoperatively. In one case a small theca cell tumor was observed incidentally at necropsy. Thirteen patients were living at the time of follow up and had been well for postoperative periods varying from 6 months to 33 years. Surgical treatment in cases of theca cell tumor need be directed along radical lines only because of associated lesions that is uterine fibromyomas and endometrial carcinoma and not because of any malignant potentialities inherent in the theca cell tumor itself. Since however the incidence of associated uterine carcinoma is so high among postmenopausal patients who have theca cell tumors we believe that hysterectomy and bilateral salpingo-oophorectomy is the operation of choice in the case of older patients who have theca cell tumors of the ovary. Similarly it would seem from this study that postoperative roentgen therapy is indicated only in those cases in which carcino-

ma involves the cervix or the fundus of the uterus.

SUMMARY

Data on 23 cases of theca cell tumor are presented with a correlation of clinical pathologic and chemical data. These tumors appear to be derived from the ovarian mesenchyma and are closely related to the granulosa cell group of tumors. Occasionally the relation may be a histologic one with elements of both types discernible within the same neoplasm. Usually however both tumors present purity of type. The relatively high incidence especially in postmenopausal patients of associated myometrial hypertrophy and uterine fibromyomas combined frequently with endometrial hyperplasia and cervical and fundal carcinoma suggests the production by the ovarian tumors of estrogenic hormone. Inability to demonstrate measurable quantities of this hormone through assays of tumor tissue is perhaps not to be regarded as conclusive evidence of absence of the hormone. A chemical analysis of 8 theca cell tumors gave evidence that these tumors contained increased amounts of cholesterol and cholesterol ester fractions as compared with the values for these substances found present in 7 normal ovaries.

Although the tumors did not invariably produce clear cut clinical symptoms their presence could often be suspected by an alteration in the menstrual habits of the patient. Postmenopausal bleeding from a hypertrophic endometrium was commonly encountered in these patients.

Histologically in spite of the employment of new stains we found difficulty in distinguishing certain fatty fibromas from theca cell tumor. In such doubtful cases examination of the endometrium was often of value.

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THE RATIONALE OF CALCIUM PHOSPHORUS AND VITAMIN D THERAPY IN CLINICAL HYPERTHYROIDISM

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THE exact mechanism of action of calcium and its consequent therapeutic indications in hyperthyroidism are as yet not fully understood even though its use has been recommended for years by several experienced clinicians including Theodor Kocher. In fact certain investigators (26-27) have expressed doubt that added calcium would be beneficial in counteracting the negative calcium balance of this disease although their investigations had not extended this far.

Our knowledge concerning the influence of calcium administration on hyperthyroidism is as yet meager and at times confusing. In the treatment of any disorder it is advantageous to understand the physiological and pathological background of the disease for which the therapeutic agent is used. Wherever possible rational drug therapy should be based upon a correlation of the pharmacodynamic action of the drug with the pathological physiology of the disease. With these basic ideas in mind it seemed essential from a therapeutic standpoint to determine whether a positive calcium balance could be maintained on a high calcium intake. We therefore present observations concerning the effects of calcium therapy on the calcium metabolism of hyperthyroidism.

GROSS DISTURBANCES OF CALCIUM METABOLISM IN HYPERTHYROIDISM

The gross disturbances of calcium metabolism which exist in hyperthyroidism may be easily understood by study of the composite Figures 1 and 2 together with Table I. They usually consist principally of an increased excretion of calcium through both the gastrointestinal and urinary systems (Fig. 1). The

blood calcium usually remains within normal limits (Fig. 1). It is rarely slightly increased and almost never slightly decreased beyond the range of normal (56-66). The blood phosphorus is almost invariably within normal range. Only on one determination in one patient did we find it increased beyond the range of normal. Never has it been decreased. The blood phosphatase is usually slightly increased. These abnormal findings differ greatly from those in hyperparathyroidism in which the increased excretion occurs almost quantitatively through the urine (Fig. 2) while the blood calcium, phosphorus and phosphatase levels are usually greatly disturbed (Fig. 2). These abnormalities lead to definite differences in the clinical manifestations of the disturbed calcium metabolism in these two disease entities which may be of definite therapeutic significance as will soon be pointed out. The loss of calcium of the usual patient with exophthalmic goiter (10) is often much greater than that of the usual hyperparathyroid patient on a low calcium diet (Fig. 2) thus emphasizing the grave calcium depletion which may occur in hyperthyroidism. There is a lower level of increased excretion of calcium in toxic nodular goiter as compared to that of exophthalmic goiter (Fig. 1). This difference in excretion in the two types of goiter occurs even when the basal metabolic rates are at the same increased level as shown by patients presented in another communication (66) and by other patients with higher levels of basal metabolism (Fig. 3). However the state of the calcium balance is not wholly independent of the degree of hyperthyroidism. In patients with nontoxic nodular goiter the calcium metabolism remains normal (Fig. 1).

Disturbances of the calcium metabolism vary greatly. They are usually temporary, preventable and reversible in character. They can easily be controlled by ingestion or parent

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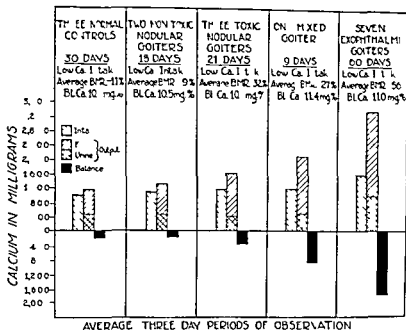


Fig. 10. Comparison of calcium balance in hyperthyroid patients and in normal patients.

teral administration of extra amounts of calcium as will be seen presently. Ingestion of milk with its high calcium content leads to calcium retention (Fig. 10). The state of the calcium balance in hyperthyroidism is dependent to a great extent therefore on the actual calcium content of the diet. If iodine

administration returns the basal metabolic rate toward normal one may expect a decrease in the calcium excretion (66). Parenteral administration of calcium (Fig. 10) thyrotoxic (66) or thiouracil (71) may also produce a positive balance.

Various experimental and clinical demonstrations of gross disturbances of calcium and phosphorus metabolism in hyperthyroidism have also been made. Falta, Bolaffio, and Tedesco (1909) were among the first to report the effect of the thyroid gland on mineral metabolism. They found that thyroid feeding increased phosphorus elimination. A most remarkable study was made in 1910 by Dr. Caroline Towles in association with Dr. L. F. Barker of the Johns Hopkins Hospital. She studied the calcium balance of three women with exophthalmic goiter, one of whom was pregnant. She concluded that the calcium metabolism of Basedow's disease shows no special peculiarity; it runs parallel with the nitrogen balance, and in those periods of the disease in which there is loss of nitrogen there is also a loss of calcium. She showed that the calcium balance may be made to be posi-

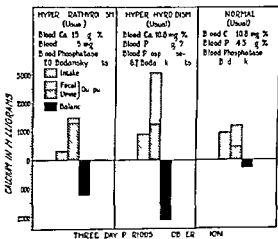


Fig. 11. Comparison of calcium balance in hyperthyroid patients and in normal patients.

TABLE I—COMPARISON OF CALCIUM BALANCE OF HYPERTHYROID PATIENTS WITH THAT OF NORMAL PERSONS AND NONTOKIC NODULAR GOITER PATIENTS

Type of disease	No. of patients	Time of study, days	Average intake of calcium, gm	Average excretion of calcium, gm	Average balance of calcium, gm	Average intake of calcium, gm	Average excretion of calcium, gm	Average balance of calcium, gm
Normal	11	3	—	—	—	—	—	—
Nontoxic nodular goiter	3	—	—	—	—	—	—	—
Hyperthyroid	—	—	—	—	—	—	—	—
Endemic goiter	—	—	—	—	—	—	—	—

tive with a sufficient intake from milk or calcium lactate though not without evidence of the tendency to loss

Parhon (1912) demonstrated that intensive thyroid feeding up to lethal dosages administered to 9 rabbits produced a definite loss of calcium. Kummer (1917) studying an exophthalmic goiter patient of 42 years found that the urine calcium excretion was normal on an intake of about 5 grams of calcium daily from milk but that the fecal calcium elimination was large. Michaud (1930) reported increased calcium elimination in thyrotoxic goiter. Snapper (1933) found hypercalcaemia of almost three times the normal value in a case of Basedow's disease. Pugsley and Anderson (1934) demonstrated marked calcium loss of rats fed desiccated thyroid. In 1936 Coryn observed that there is excessive loss of calcium in the urine. Further work by Cope and Donaldson (1937), Beaumont, Dodds and Robertson (1940) and Logan, Christensen and Kirkin (1941-42) brought forward still more evidence that increased thyroid activity or thyroid feeding are associated with an increased excretion of calcium and phosphorus.

The mechanism of these disturbances in hyperthyroidism has never been clearly demonstrated (6, 12, 53, 66, 68, 69). Recent thioracil studies (71) would tend further to uphold our hypothesis (61) that the cause of this increased excretion is due to a combination of factors underlying which is the increased utilization of the thyroid hormone by the tissues. When thyroid hormone production is decreased mineral elimination returns toward normal.

CLINICAL MANIFESTATIONS OF THE DISTURBED CALCIUM METABOLISM IN HYPERTHYROIDISM

Clinical symptomatology. The thyroid gland may affect the structure and functional activity of every component of the human body. For this reason hyperthyroidism presents numerous clinical manifestations. Manifestations of the disturbed calcium metabolism in this disease are thus also greatly variable. Clinically they may be absent or so mild that they are masked by the more predominating toxic symptoms. Painful muscular joint and bone complaints are of frequent occurrence (67, 59, 9, 80). Usually these are mild in character. Severe forms are rather uncommon and may simulate symptoms of acute posttrauma-

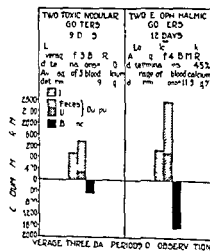


Fig. 3. Comparison of calcium balance in two toxic nodular goiters and two endemic goiters. The balance in the toxic nodular goiters is negative, while in the endemic goiters it is positive. The balance in the toxic nodular goiters is negative, while in the endemic goiters it is positive.



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matic or Sudeck bone atrophy. In many instances these have been erroneously diagnosed as a nonspecific and obscure form of arthritis. The first signs are swelling and intense pain on movement with subsequent increasing limitation of motion and atrophy of the muscles involved. Tenderness, myasthenia, contractures of muscles and pseudo-fixation of joints may later occur. In these more advanced cases the patient often becomes bedridden. In the early stages roentgenography reveals a generalized mottled atrophy; later there is more diffuse resorption with loss of normal trabeculations (Fig. 4). These phenomena may be manifestations of an autonomic nervous system disturbance which is frequently present in hyperthyroidism. In such cases high calcium and vitamin D feeding, as well as thyroidectomy, have been found to give definite symptomatic relief even though roentgenograms did not give evidence of recalcification (O'Brien). Ordinary medical means except morphine failed to relieve the severe pain suffered by one of our patients (M.H.) but adequate calcium, phosphorus and vitamin D gave prompt relief.

There is greater tendency for the development of symptoms of the disturbed calcium and phosphorus metabolism in exophthalmic goiter patients than in patients with toxic nodular goiter. This is probably due to the fact that loss of lime salts is usually much greater in exophthalmic goiter. The manifestation of toxicity in nodular goiter is more frequently insidious so that they may exist for years before adequate treatment is instituted and therefore slow loss occurs over a long period of time. It is also possible that toxic nodular goiter patients who are usually older are predisposed further to senile osteoporosis.

Skeletal decalcification. Skeletal decalcification had been described by von Recklinghausen in 1891. Many similar reports of bone atrophy have since been made. Von Recklinghausen and Koepfen published accounts of a woman of 23 years with exophthalmic goiter of 5 years duration. At autopsy the bone saved like rotten wood, the sternum and calvarium being readily cut with a knife. Histologically resorption spaces were abundant in the bone cortex and they often contained whole nests of osteoclasts. He believed this a form of osteomalacia secondary to Basedow's disease. Von Recklinghausen stated that the degree of osteoclastic resorption was equalled only by that found in a case of generalized osteitis fibrosa cystica studied by him. In 1901 Askanazy described necropsy findings of a woman of 34 years with retrosternal goiter of 5 years duration with carcinomatous degeneration and with metastases to the lungs. The histological picture revealed osteoclastic resorption of bone of greater severity and extent than could have been predicted from the macroscopic appearance of the bone. Latzko (1901) found hyperthyroidism pre-existent in 6 of 150 cases of osteomalacia. Hoenmickel (1904) attributed the decalcification observed in thyrotoxicosis to a disturbance of phosphorus metabolism. Curchimann (1910) reported 30 cases of nonpuerperal osteomalacia, some of which were associated with hyperthyroidism. Plummer, Dunlap and Morrell and Dunlap and Moore (1918-19) reported cases of osteoporosis. Four were secondary to exophthalmic and 1 to adenomatous goiter. They were all women. The ages ranged from 20 to

64 years. The duration of symptom of hyperthyroidism was from 1 to 13 years. The basal metabolic rates varied from plus 27 to plus 74 per cent. One patient had been bedfast because of so called arthritis. The bone lesions on x-ray examination were suspected of being carcinomatous metastases in patients but further study ruled this out. At autopsy the ribs of a 53 year old woman with exophthalmic goiter of 13 years duration and a basal metabolic rate of plus 41 per cent revealed multiple spontaneous fractures. They were friable and could be easily crushed between the fingers. Marked generalized osteoporosis was also present. Hunter (1930) reported the summary of a necropsy done by Prof. Turnbull on a girl of 19 with exophthalmic goiter of 5 years duration. Histologically lacunar resorption by osteoclasts produced much rarefaction of the cortical, the spongiosa and the medullary cavity. Another woman of 28 years with exophthalmic goiter of 5 years duration showed similar severe osteoporosis.

In 1932 Osterberg and Mill using Mayo Clinic material concluded that chemical and roentgenographic study of bone removed post mortem from the ribs and pelvis of 23 hyperthyroid patients and of 78 control subjects failed to demonstrate a sufficiently constant difference in percentage of ash, percentage of calcium, calcium to phosphorus ratio or roentgenographic opacity to warrant a conclusion that hyperthyroidism is always accompanied by some degree of osteoporosis. They stated that obviously ingestion of calcium is not controlled pre-mortem in clinical hyperthyroidism so that the results of work of this nature apparently can be only inconclusive. In experimental hyperthyroidism in estimation of calcium may be controlled. Smith and McLean as well as Drill reported that chemical studies of bones of rats with severe hyperthyroidism induced by thyroid feeding which were fed simultaneously a diet adequate in calcium did not reveal osteoporosis. Unfortunately their control of exogenous calcium was not entirely satisfactory.

Akanazi and Rutishauser (1933) studied pathologic material from 7 cases in which patients had died of Graves disease. Osteoporosis

of some degree was evident in all. In 1938 Martos examined the bones of 12 patients who had died of exophthalmic goiter and found osteoporosis in 11. In 1938 Crotti reported the summary of a necropsy on a woman of 34 with exophthalmic goiter of at least 10 to 13 year duration. The x-ray examination showed generalized osteoporosis especially involving the bones of the lower extremity. A spontaneous fracture of the upper third of the right femur was present. The bones cut easily and could be crushed with the fingers. Histologically the bone marrow showed almost complete absence of bone forming tissue in the softest areas.

Radiologic findings. It was Kummer in 1917 who presented probably for the first time roentgenographic evidence of osteoporosis associated with hyperthyroidism. Roentgenography in the early disease is usually negative but in advanced stages generalized decalcification of the skeleton may be obvious as has been reported by numerous other observers (Fig. 4). This osteoporosis must be differentiated from that of several diseases. Among them are hyperparathyroidism, malignancy metastatic to bone, senile osteoporosis, atrophy of disuse, osteomalacia and osteoporosis which may accompany pancreatic diabetes as well as pituitary and adrenal disorders.

After calcium elimination studies as well as radiologic examinations of the skeleton of one patient Kummer judged from the roentgenograms that the calcareous demineralization affects the bony system. Bernhardt in 1917 made roentgenographic studies of a woman of 47 years with exophthalmic goiter. These showed a decrease of calcium in the bones. Aub and his associates in 1929 observed similar changes and pointed out that in mild cases osteoporosis can be detected only by direct comparison with the same bone of a normal person exposed on the same film at the same time. Hummer, Dunlap and Moore and Dunlap and Moore found roentgenographic evidence of severe osteoporosis in 4 patients with exophthalmic goiter and in 1 with adenomatous goiter. In 1930 Donald Hunter stated that in his experience controlled roentgenograms of the bones in exophthalmic goiter revealed a decrease of calcium in less than half

the cases examined Stettner has reported an interesting case of decalcification of the bones of a child resulting from the continued administration of thyroid. After the thyroid had been discontinued the bones became denser. Golden and Abbott made a roentgenographic study of 110 cases of hyperthyroidism in 1933. The age of the patients varied from 6 to 68 years. The duration of thyrotoxic symptom was from months to 6 years. In 63 instances only chest films were available. In the remainder there were films of the spine, pelvis or extremities. Eleven per cent showed slight while 11 per cent showed definite to marked decalcification. In 9 unselected cases a comparison was made to normal following Aub's method. These patients ranged from 22 to 50 years. The duration of disease was from 4 months to 4 years; in 5 instances it was not over 6 months. Of the 9 cases 5 showed definite evidence of osteoporosis and one slight decalcification. Still others such as Means, Hertz and Lerman (1937), Coryn (1936), Crotti (1938), Bartels and Haggart (1938) (9), William and Morgan (1940) and Mansbacher (1941) set forth their roentgenologic findings which suggest that osteoporosis is by no means rare in hyperthyroidism. Although the chronicity as well as the severity of clinical thyrotoxicosis is an important factor, cases have been reported of moderate thyrotoxicosis of short duration with definite evidence of osteoporosis on the x-ray film.

Further symptomatic osteomalacia, gross deformity, dwarfism and spontaneous fractures. In a few cases osteoporosis is profound in degree. Osteomalacia has occurred with or without subsequent gross deformity of the bones and dwarfism. In some cases spontaneous fractures have resulted. The severity of these symptoms depends upon the stage, the duration and the complications of the disease at the time of diagnosis as well as upon the degree of calcium excretion and the amount of calcium intake during the entire course of the disease.

Osteomyelitis and dwarfism may be due to fracture or severe osteomalacia. Subjective symptoms are often associated. The patient of Von Recklinghausen and Koeppe who had osteomalacia complained of backache which

caused her to notice that her spine was tilted. I am in both arm and sometime cramp in the hands and feet were also present. A *kypho colio* was present. Askanazi's patient with osteomalacia and goiter was in bed with sacral backache following a slight fall. Latzko (1901) and Tolot and Sarrionat (1906) again drew attention to the combination of osteomalacia and hyperthyroidism. The latter reported a single case. They had found 11 observations in the literature on the relation of these two conditions. Von Jakich and Roth (1908) reported softening of the lining of the bones in a girl of 20 who suffered from hyperthyroidism and Bernhardt (1917) observed a similar case.

One of the patients of Hummer and Dunlap (1918) had been bedfast because of spinal arthritis. Another showed spontaneous fracture of the rib and osteomalacia at necropsy. Hunter (1930) reported 2 cases in which spontaneous fractures occurred. Snapper (1933) stated that the osteoporosis produces much generalized pain and that it is definitely benefited by thyroidectomy. Coryn's patient, a woman of 35 years, presented painful osteoporosis especially of the tibiae. Another of his patients, a woman of 61 years with Basedow's disease of 9 years' duration, decreased in height from 1.65 to 1.39 meters and sustained a multiplicity of spontaneous fractures of one femur, radius and vertebra associated with extreme decalcification. He believed that thyroidectomy benefited these patients. Gotthieb and Schachter Nancy's (1937) patient, a female of 53 years with exophthalmic goiter of 5 years' duration sustained two spontaneous fractures of the right humerus and showed marked decalcification with a thin line cortex on x-ray examination.

One of the patients of Means, Hertz and Lerman (1937) who had had hyperthyroidism for 9 years was driving her automobile when she was suddenly seized with knife-like pain in the region of the lumbar spine. A roentgenogram demonstrated marked decalcification of the entire spine and pelvis and a compression fracture of the first lumbar vertebra. Another patient, a female of 8, had been bedridden because of long-standing osteoporosis. Dorsal kyphosis with flaring of the ribs was

present. Following thyroidectomy she gradually returned to her normal activities and the kyphosis improved greatly. Some of the improvement was attributed to an adequate diet of calcium and vitamin D. Moehlig and Adler (1937) mentioned the painful bones associated with hyperthyroidism. They did not believe that marked benefit could be derived from thyroidectomy. Crotti (1938) reported 4 cases of exophthalmic goiter and 1 of toxic nodular goiter who presented a variety of musculo-skeletal symptoms. The age range was from 19 to 61 years. Three were females and 2 were males. Duration of toxic symptoms varied from 6 months to 5 years. X-ray examination showed definite osteoporosis in 3 and possible osteoporosis in 1. One patient who came to necropsy showed intense decalcification with a spontaneous fracture of the upper third of the right femur. Three patients showed remarkable improvement of the skeletal symptoms following thyroidectomy.

Bartels and Haggart in 1938 added more cases of primary hyperplasia of the thyroid with multiple spontaneous fractures of the femur and vertebrae after slight falls or stooping. They were females of 50 and 78 years. The toxic symptoms had been of 9 and 17 years duration respectively. Jung and Jacob (1939) described a fracture of the left clavicle in an elderly woman with osteoporosis and hyperthyroidism. Williams and Morgan (1940) added 7 cases of thyrotoxic osteoporosis seen at the Vanderbilt University Hospital. They were all females and their ages ranged from 39 to 65 years. Toxic symptoms had been present for from 3 months to 20 years. The basal metabolic rates varied from plus 31 to plus 65 per cent. Four were toxic nodular and 3 were toxic diffuse goiters. Four patients experienced muscle or joint pains before bone abnormalities were recognized. One exhibited scoliosis and tenderness over the lower thoracic and upper lumbar vertebrae. The roentgenograms revealed compression fractures of several vertebrae as well as generalized demineralization. Carcinomatous metastases were at first believed the cause. In one stiffness and bony enlargement of many of the joints of the extremities were noted. X-ray findings imitated metastatic tumor. A third

patient presented a pathologic fracture of the femur and generalized osteoporosis. Still another showed compression fracture of the lumbar vertebrae. Metastatic tumor was considered. X-ray examination showed marked generalized demineralization of the skull and long bones as well as of the vertebrae. The fifth patient showed kyphosis of the dorsal spine. Marked osteoporosis of the ribs and spine was evident on x-ray examination. Another patient revealed marked weakness and atrophy of the muscles especially in the hands. She sustained compression fractures of the thoracic vertebrae and demonstrated generalized decalcification. Three of the four patients exhibited tendencies to fall and one remained inactive because of fear that she would fall. Two improved symptomatically following thyroidectomy but none exhibited roentgenographic evidence of increased calcification 3 to 14 months after operation. The diet however was not carefully managed.

Mansbacher's patients (women of 58 and 61 years) also complained of persistent pain in the shoulders and of kyphosis and back pain respectively. X-ray pictures showed generalized osteoporosis. Thompson (1944) recalled a minister with hyperthyroidism who was reported suddenly to have become 2 to 3 inches shorter on Sunday while preaching a few weeks after a thyroidectomy. He had suffered from spontaneous fractures of two vertebrae. X-ray examination revealed uniform decalcification. Two (M.H. and D.D.) of the 5 patients whom we report herewith showed generalized osteoporosis. One (M.H.) showed remarkable improvement of the associated musculoskeletal symptomatology and retention of as much as 1 gram of calcium and 12 grams of phosphorus daily when adequate amounts of these elements were supplied. They both showed clinical improvement following thyroidectomy although the x-ray picture even 5 months later showed no appreciable change except for definite recalcification of the hand bones of M.H. after continued adequate mineral intake. This may be explained on the basis that they had hyperthyroidism for a few years and that it would take many more months of adequate supply to replace completely the depleted store. On

patient (I M) complained of moderate deep aching pains of the extremities. Another patient (M C) complained of occasional vague pains over the entire body but especially of the lower extremities.

Calcium and production of goiter. An upset of the calcium metabolism has been considered by many a factor in the production of goiter since early in the nineteenth century (28-61). Investigators have also believed that a disturbance in the calcium metabolism is causally related to some of the toxic symptoms of hyperthyroidism. But not even the gross disturbances were revealed until recently (6-61). Even though the total blood calcium is usually normal a disturbance of one of its fractions may be present (34). This problem needs further investigation. The total protein levels (see tables) are usually normal. Slight decrease may be expected in 30 per cent of the cases, the level averaging 5.7 grams per 100 cubic centimeters of plasma and ranging from 5.4 to 5.9 grams (normal 6 to 8 gm %). Only one was decreased to as low as 4.9 grams per cent. Compare with Bartels' findings (8).

Clinical hyperthyroidism and hyperparathyroidism. In hyperparathyroidism with its usual hypercalcemia and hypophosphatemia there frequently results metastatic calcification. Urinary stones occur in about 50 per cent of the recorded cases () and constitute one of the serious complications of this disease. In hyperthyroidism on the other hand with its usual eucalcemia and euphosphatemia even in the presence of increased calcium and phosphorus excretion equal to or often greater than that in hyperparathyroidism (Fig.) metastatic calcification rarely occurs (48-53). Urinary stones are uncommon and are probably only coincidental. Cases of simultaneous hyperfunction of the thyroid and parathyroid gland have been reported (32). The real danger in feeding high calcium and phosphorus preoperatively to patients with hyperparathyroidism is that it may increase the predisposition to metastatic calcification. In hyperthyroidism no such danger exists.

In 1916 we discovered incidentally while doing iodine and calcium correlation studies that one of the patients with hyperthyroidism

showed remarkable retention of calcium over normal when enough was given to meet the increased metabolic requirement of the disease (66). This demonstrated to us the possible need for adequate calcium therapy and led us to investigate the effect of calcium feeding upon the negative calcium balance of hyperthyroidism. Until that time it had been believed that ingestion of extra amounts of calcium did not influence the retention of calcium. Since then we have given all of our hyperthyroid patients calcium, phosphorus and vitamin D preoperatively. In this respect it is significant that none of the patients who received an adequate supply of calcium, phosphorus and vitamin D developed so-called thyroid crisis. The postoperative reactions have been minimal. There have been no deleterious effects (64).

Certain patients with impending thyroid crisis who did not react to iodine or who escaped from iodine control subsequent to prolonged administration of iodine were treated successfully and more quickly prepared for surgery by use of adequate amounts of calcium, phosphorus and vitamin D as well as iodine and proper general management with out employment of an iodine vacation. Patients with severe acute spontaneous exacerbations of hyperthyroidism were more easily brought under control and more adequately and promptly prepared for surgery by use of the common conservative method including judicious bed rest and control of physical activity, freedom from emotional strain together with a balanced diet of high vitamin, high protein, high carbohydrate and high caloric content and iodination along with added calcium, phosphorus and vitamin D (64).

The fundamental importance of these clinical factors in the management of hyperthyroidism has led us therefore to attempt to determine the effects of adequate calcium, phosphorus and vitamin D therapy on the gross disturbance of the calcium balance in this disease.

EXPERIMENTAL METHODS

The principles underlying the clinical and laboratory method have been set forth in de-

tail in previous papers (61, 6, 63, 66). In investigations were accomplished under strict conditions of supervision with only those directly in charge of the work being permitted to handle the food, the specimens and the medications of each patient. During a preliminary or observation period of at least 4 days to establish exogenous control of the calcium and phosphorus metabolism, the patient was reviewed historically and physically as well as by laboratory methods including the complete blood count, urinalysis, essential blood chemistry, radiologic studies and liver and renal function tests to determine suitability for study. At the same time the patient selected a constant adequate and palatable diet and became adjusted to the new diet and new procedures. Whereas our previous studies have been confined almost entirely to low calcium intakes, in this study many periods on a high calcium diet were also included to follow periods of low calcium intake. The calcium content of the diet was increased principally by the addition of milk. The high calcium diet was supplemented by use of different sources of calcium, phosphorus and vitamin D. The daily fluid intake, the salt intake and the acid base values of the diet were kept constant. The diets given and the dietary methods used are presented in another paper (5, 61). We considered the nitrogen balance because it has been shown that this usually remains negative in the hyperthyroid patient unless excess protein is given to maintain a positive balance. We did not do nitrogen balance studies. An allowance of 1 gram of protein per kilogram of body weight is usually enough to prevent nitrogen loss if a sufficient caloric intake is maintained to prevent loss of body weight. These patients were maintained at a constant weight throughout the low and high calcium and phosphorus feedings, and the protein content of both the high and of the low calcium and phosphorus diets was kept constant at $1\frac{1}{2}$ to 2 grams daily per kilogram of body weight. The carbohydrate intake was kept high. The fat intake was kept low.

A perchloric acid method (61) with minor modification was used for the determination of calcium in the food, urine and feces. The

serum calcium was determined by the Clark and Collip (15) method, the blood phosphorus by the method of King (37), the blood phosphatase by a modification of the Bodansky method (70) and the blood total proteins by the falling drop method of Tagan (36).

EFFECTS OF ADEQUATE CALCIUM PHOSPHORUS AND VITAMIN D ADMINISTRATION ON THE NEGATIVE CALCIUM BALANCE OF HYPERTHYROIDISM

Six patients with hyperthyroidism were investigated over several periods on diets of relatively low calcium content which were followed by periods of study on diets of high calcium content with added milk as the principal source of increase. The high calcium diets were then supplemented during subsequent periods by different sources of calcium, phosphorus and vitamin D. The protocol and results of the investigations of one patient (F.W.) have already been presented (66). Those of the other patients may be reviewed briefly as follows:

M.H. No. 4399, white female, 52 years of age, entered University Hospital on March 31, 1941, for the surgical treatment of toxic nodular goiter. She had a long history of hyperthyroidism, with typical toxic nodular goiter of 3 years duration. The symptoms including nervousness, palpitation, fatigue, irritability, intolerance and nervous perspiration. There were pressure symptoms of dyspnea and occasional dysphagia. The appetite was poor, the food intake was poor and there was a weight loss of 8 months prior to admission. The predominant symptoms of hyperthyroidism were referable to the musculoskeletal system. These included the symptoms of acute post-traumatic osteoarthritis of the joints. She complained of aching tenderness and of intense pain of the upper extremities and of the shoulder joints with subsequent limitation of motion of these joints. Generalized myasthenia and muscle joint pains were associated. The myasthenia was so severe that she became drooping. The pain was so intense that she required morphine occasionally.

Her calcium intake was 1.5 g daily well nourished white female who had been considered capable of heavy work and marked tremors of the hands. There was no exophthalmos and the exophthalmometric readings were 6 millimeters which are normal. The thyroid was enlarged and nodular. The skin was warm and moist and a tachycardia was present. Active and passive movements of the shoulder joints were markedly limited by severe pain. Reflexes were hyperactive.

TABLE II—DATA FROM M. H. N. 41-399 WHITE FEMALE OF 5 YEARS WITH TOXIC NODULAR GOITER

P. no.	D. per cent	W. igh. 2gm.	Calc. m.					D. os.	B. roof.					B. M. R. per	R. l.
			Ou. pu.			I. k. gm.	B. l. ac. gm.		Serum cal. m. m. pe.	Se. m. ph. ru. m. m. pe.	Pho. ph. Rod. n. k.	T. l. rot. m. pe.			
			L. gm.	Fec. gm.	T. l. gm.										
I			39	41	7.6	09	-6		8				+5	B. l. res.	
II		5	6	6	7	09	6	-8			3		+		
H. h. cal. m. d. f. 3. lo. es. w. h. m. ro.															
III		5	498		589	80	+28		7	3	3		+	600 m. k. d. l.	
IV	3			546	463	4.867	+004		6				+		
H. h. cal. m. d. i. m. d. h. l. c. m. l. d. d. sol. b. m. h.															
V	6		76		6	6	+3	47				6	+	30 soft d. l.	
VI			3	04		6.5	9	-2		3	3	6	+	1 m. l. ar. po. l. d. d. d. l.	
H. h. ak. m. d. pp. l. m. ed. w. h. d. cal. um. phosph. b. soe. l. b. moq. h.															
VII		59	56	3	7.5	43	+0	24	3		3	5	+20	600 soft d. l.	
VIII			3	099	44	8.43	+590		8		3		+7	ph. d. l. us.	

Admission d. bl. d. cou. t. na. 5.00.000. th. the hemogl. b. n. 14.5 grams per cent. The hit blood co. nt. as 8.600 with the neut. phl. 3 percent th. lymph. cytes 3 pe. cent th. m. nocytes 2 pe. cent th. eosin. phl. 3 pe. cent a. d. th. b. s. phl. 2 pe. cent. The u. n. a. l. y. i. as n. g. t. e. The W. ser. mann and Kahn r. act. ons of the blood. e. ga. t. e. The ba. l. m. t. bo. l. e. ate. n. Apr. 14. 04. a. plus 35 pe. nt. ith. the basal p. l. oo. the temper. atur. 98. d. g. es. f. th. resp. t. r. y. t. t. o. th. blood p. e. u. e. 30. 35. tol. nd. od. stol. e. d. th. weight. 4 pound. Th. t. tal. bl. od. d. n. a. oo. with the acetone n. ol. ub. e. fract. 83 microgram. pe. ent. The blood. mylase. a. 4. u. its. h. ch. is. no. mal. The blood. ch. leste. l. s. 46 m. l. g. ms. pe. c. t. Th. p. th. m. b. i. n. m. l. Th. h. p. p. ic. acid. l. e. f. net. on. test. y. eld. 3. grams. no. mal. res. l. t. Th. br. ms. lph. i. n. test. as. m. l. Th. ph. l. ulf. nph. t. l. n. t. s. h. l. s. 1.5. pe. c. t. x. cr. t. i. n. n. the. t. r. s. t. h. u. l. pe. t. d. ng. th. cond. h. aft. r. t. a. e. d. m. n. t. at. i. n. Ro. x. t. g. n. o. g. r. ph. h. d. g. n. r. al. el. o. s. t. i. r. os. p. a. t. cularly. f. the upper left h. m. ru. (F. g.)

Calc. m. s. t. des. mad. f. m. Apr. 14. t. Apr. 18. 04. Al. cal. m. d. t. (T. ble. II. a. d. F. g. 3). w. g. n. f. 6. d. a. d. t. f. h. g. cal. m. n. t. t. p. n. c. ally. du. t. add. t. f. d. o. o. c. t. m. t. r. s. f. s. k. u. d. m. l. k. d. a. l. th. d. m. i. n. s. t. d. f. 0. day. The h. g. cal. m. d. t. as. 1. f. l. t. d. b. 15. g. a. n. s. cal. m. l. t. t. a. d. l. p. s. f. d. d. l. d. a. l. y. fo. 6. d. a. D. r. g. th. l. a. t. 6. l. th. h. g. cal. u. m. d. t. as. 1. p. l. m. n. t. d. b. y. f. r. s. f. d. cal. d. a. l.

B. lateral. ubt. tal. thyr. de. tomv. s. d. n. n. M. y. 9. 4. t. f. l. l. d. b. y. a. n. n. t. f. l. e. er. y. G. oss. nd. m. r. c. p. stud. es. sh. d. l. ul. go. t.

There was remarkable improvement of the entire musculoskeletal symptomatology. Considerable improvement in movement of the shoulder joints was attained. The basal metabolic rate decreased from plus 35 to plus 17 per cent on general management without iodine. Calcium studies on a low calcium diet averaging 100 milligrams per period showed definite increase in loss of calcium over normal. With the administration of extra amounts of calcium (Table II and Fig. 3) the patient retained as high as 2 grams of calcium and 1.2 grams of phosphorus daily. After 8 days of high calcium feeding she experienced remarkable relief from pain. Movement of the shoulder became progressively better. The myasthenia decreased so that she was able to sit up in a chair. Roentgenographic studies made 5 months after the operation following continued adequate calcium therapy showed no appreciable decrease in the osteoporosis of the humeri but definite improvement in that of the hand bone. M. an. H. rtz and Lerman

TABLE III—DATA FOR M C N 413528 WHITE FEMALE OF 56 YEARS TOXIC NODULAR GOITER

No.	Date period started	Weight kgm	Cal m					D	Blood				B.M.R. per cent	Remarks	
			Output			Intake gm	Balance gm		Serum cal m mgm per	Serum phosphorus mgm per	Phosphatase Bodan- k m	Total gm per			
			U gm	Feces gm	Total gm										
Low cal m d f 86 calories with 00 gm p in															
I	5	60	400		00	-0.3	5	4		4	+29	Bedres			
II		60	66	3.5	8	-0.3	5.5	8	7.6	6	+7				
III	5.6	5		86		00	-5		5.5	7.5	6		+		
High cal m d f 3 6 calories ppl m d by d-c l m phosphatase with os l f rs															
IV	5.9		44	6.6	7.5	8.08	+867	5	6		6	+3	600 regul m d d l m os h f rs w l d l		
V		9	44	4.35	76	8.08	+06		7	3.7	6.6	6		+20	

abolic rate from plus 3, to plus 0 per cent. On a low calcium diet averaging 1109 milligrams per 3 day period definite loss of calcium oc-

curred over normal (Table III and Fig. 6). When more calcium was supplied principally from milk and wafers of dicalcium phosphate with viosterol a sudden reversal of the calcium balance occurred with considerable retention of calcium (Table III and Fig. 6).

This patient with mixed goiter showed a greater excretion of calcium than the usual patient with toxic nodular goiter but less loss than the usual patient with exophthalmic goiter. She clearly demonstrated retention of calcium when the nutritional needs for calcium were met.

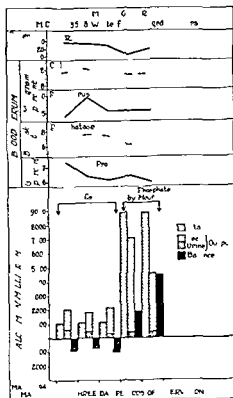


Fig. 6. When adequate calculation was applied principally to the *monod* and *residual* components with most of the reversal of the calculation balance occurred with the *h* and *t* components.

L M N 408788 a white f m le f 45 y ar
tered Uni e tye ll pit l n Decemb r 11 91
for m nag m t f l phthalmic g tr Sh e c
pl i ed b tle ly of m k d nerv s rrt b lty se
e e p l pita n a d m t i na l nst b lty Abo t
i m nthp r to d m h beg t not c a d
d nge al d rvo s m k d t emb l g
th e t m tes he d h s e sy fatg b lty nd
p of perspratio l p es t Aw k late
she b r v d a ll g h r ne k wh h lo ly
became l g A eght lo f fcom 05 to 47
pou da c mpan ed these symptom I adit
the e e m le t d p h ng p ns of the pper
a d low trem t e P ly d ps and poly
pese t alo g th ca l ch k g n t n
nd ins mnia

nd ins mnia
lhy cal m nat r l l a ll n b d
tbl wh ppe d t m ly rvo a d r f
f ly e lag d Fi t m s f the te d d h nds
t d Th pl r t Th phth l
m m tri d g s w rm l
The adm blood t d naly w
mal The W m j kah ct fth
blood e g ti Th ba l m t hof c t

TABLE IV.—DATA FOR L M N 408788 WHITE FEMALE OF 45 YEARS WITH I NOLITHALMIC GOITER.

Food	D per cent	Wt. in kgm.	Cal m				D 94 24	Blood				BMR per	Remarks	
			Output			Wt. in gm.		Hem. gm	Serum cal. m gm	Serum non-hos-hor m m	Phospha-se Bodan ky			T l p m
			U l gm	Fec m	T l m									
Low cal m d f 3 000 l es h 99 gm pr														
I	8	67	76	764	48	005	- 4 6		93	4	54	63	+95	B d
II	2- 40	67	3 5	3 855	5		-3	2-		5	78	6	+	
High cal m d f 3 58 l es h 3 gm pr														
III		67.4	737	75	5 6		+ 6	1	6	45	3	55	+ 5	500 ml d soft ly
IV		67.3	3 5	6 304	65		+0 8	1	4	3	36	-4	+99	
High l m d pl m d h lc m l co t b m h														
V	50-	67.4	3 6	7-6	8	29	+0		6		7		+ 5	500 ml d soft ly
VI	66	71	9	9 008	9 27		6	3	3	4		58	+61	500 ml d soft ly

14 95 per cent with basal temperature 99 degrees
 pulse 120 and respiratory rate 20 the blood urea 20
 systolic and 60 diastolic and the body weight 67
 kilograms Total blood nitrogen was 4 milligrams
 per cent with the acetone soluble fraction 26
 milligrams per cent The blood sugar was 95 on nil
 the cholesterol 1670 milligrams per cent The blood
 urea nitrogen was 10 milligrams per cent Pro-
 thymbin was 90 per cent of normal The phenylul-
 faphthalanine reaction test was 50 per cent
 excretion in the first 24 hours per cent excretion
 during the 24 hours after the excretion was 100
 The hip joint was painful on the left side 33
 grams Roentgenogram of the hip joint pelvis
 showed no detectable osteoporosis

The calcium metabolism investigation made from December 18, 1940 to January 5, 1941. A constant high calcium diet (Table IV and Fig. 7) in which the patient had become accustomed was given during the first 6 days (55). Then a further diet of high calcium content principally consisting of 500 cubic centimeters of fluid milk for the next 6 days (Table IV and Fig. 7). The high calcium diet supplemented by grams of calcium glucoate dissolved in the drinking water for 6 days (Table IV and Fig. 7).

Later treatment continued at 100 mg daily for 7 days. The patient was discharged on 100 mg daily for 7 days. The patient was discharged on 100 mg daily for 7 days.

This woman presented severe exophthalmic goiter verging on a thyroid crisis. She improved greatly on general management with high cal sum intake and the basal metabolic rate decreased from plus 115 to plus 64 per

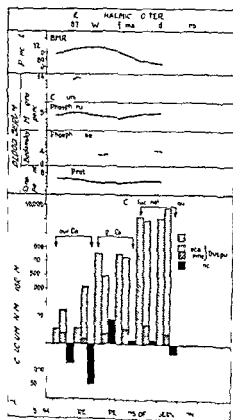


Fig 2 \ i t h m k e d g t e f b a l a
l t k e f c a l d t h d l p t f m k a l l
d l y r s a l o f t h b a l h p p e c a l

TABLE 1.—DATA ON 1 M N 405171 COLORED FILM OF 1941 IRS WITH 1 NO. 111111 MIC. COITER

I	pe	of	ed	h	Cal m					D	Blood				B I R	R mal
					On pu			I k	B lan		Serum ic um mam pe	Serum hos- ph ru gm pe	Phos- h ase Boda k nu	T 1 pro m pe		
					L gm	Fee gm	I m									
Low cal m d f oro cal es w h 99 gm per cu																
I				54	906	260	065	-			3		5	+ 5	Bedres	
II				5	3	8	06	- 3		9	4	5	4	+		
II h l m d f g t es m																
III				54	90	243	07	+0.43			6	6		+6	sym m k dal	
I					6		9	+0		5				+5		
II h cal m d ppl m d h f m l b m h																
V							6							+	m na f gm	
I	-6	5	60	96	6		-0.26		6	3.8				+6	d ed f da so period	
VII	-9	-4					+ 9.44	-8			6			+	II ben use ma k f d h	
Lo cal m f l d w h cal m h l f b																
VIII				54	27		80	- 20				8		+	3 hl f () give ul d l h pa d ll on	
IX				6	90	24	80	+0.26	3		5.3	5	5	+ 3		

cent. The total blood iodine decreased to 9.11 with the organic fraction 2.43 micrograms per cent. On a relatively low intake of calcium averaging 1033 milligrams per period there occurred a marked negative calcium balance reaching a maximum of 3110 milligrams per period (Table IV and Fig. 7). A diet of high calcium content principally due to added milk was then given. On this increased intake of calcium 659 milligrams per period there developed a remarkable and early reversal of the balance with maximum retention of 1677 milligrams of calcium per period (Table IV and Fig. 7). A decrease in retention of calcium to definite loss occurred in period V and VI when the high calcium diet was supplemented by calcium gluconate. The blood serum calcium remained within normal limits except for a definite rise in period II. The blood phosphorus and total protein remained within normal limits. The blood phosphatase was lightly increased in the first two periods but normal in other periods.

E M N 40817 a c l d fem l f 9 r
e t d L t r s ty Hosp t l N emb r 7 910
f th l t f b t l th v o lect my m
the t atm t f phthalm c g t Sh first b
c m a f g t b ut 4 5 m nth p r t
dm th t d v mpt m f e phth l
m ng n r v e s m r k d h t t l r
an t m r t l t b l t Sh al c m
p l d f t m r s f both h d dy ph g
c ns d abl dy f t Los f ght
f m 3 t p ds cc d p t f a v
p p et t w th e food int ke
Ph cal m nat d clos d a ll h d
b t t r m ly app h 3 ng m h d
gh d 54 k l g m M l t ex phth l mos f
f t m f b th ha d r b s F phth l
m m t c r a l e s w m l m e t r s l t r l a
d f u t e a m l E m nat f the
k l l d f f l a g m t f both l bes
ll a f th thm f th thv 3 gl l Thr
t d cy t l l t f th gla d A br ut as
l he l b th l bes Ph p l t o
Th fl hype ct
Adm d blood t 4 900 000 1 th th
h m gl b 3 g m pe oo cut c c nt m r s
Th ht blood t a 9 00 th tr phls
59 per e t l m phocytes 4 pe t n l m ocytes
p e c t l n al g t e Th W s
m nd k h ct n f th bl d w ga

the basal metabolic rate on November 21 1940 plus 48 per cent with the basal temperature 98.4 degrees the pulse rate 92 the respiratory rate 15 the blood pressure 130 systolic and 60 diastolic and the weight 54 kilograms Blood iodine was 20.90 micrograms per cent with the acetone insoluble fraction 4.8 micrograms per cent The blood prothrombin was 73 per cent of normal which is within normal range Blood amylase was 68 units The blood sugar a 99 and cholesteryl 15 milligrams per cent Blood urea nitrogen a 45 milligrams per cent Thymopurine diethyl function test as 23 grams a decibel within normal The phosphorus 1-phthalate renal function test showed 60 per cent excretion the first hour and 5 per cent excretion during the second hour after intravenous administration Electrocardiogram showed sinus tachycardia Roentgenography of the skeleton showed no detectable pathology

Calcium and phosphorus balance studies were made from November 21 1940 to December 18 1941 A constant low calcium diet (Table V and Fig 8) which was substituted for the patient as gain in weight first 6 days The patient received a high calcium diet (Table V and Fig 8) containing 500 cubic centimeters of milk and 5 per cent calcium for the following 6 days Then gram for calcium content daily received 10 per cent high calcium diet for the next 9 days The milk intake was as follows 75 cubic centimeters daily during the period VIII Dose I VIII and IX the patient returned to the low calcium diet plus 10 per cent calcium chloride for 10 per cent calcium chloride

Latent treatment continued adequately on a basal metabolic rate of 100 followed by an unfulfilling caloric intake of 1000 calories a day of the remaining 1000 calories of the hypocalcemic diet induced by the low

During our investigation the woman developed a diarrhea and slowly increasing basal metabolic rate of from plus 48 per cent on November 21 1940 to plus 83 per cent on December 15 1940 The total blood iodine however decreased to 10.99 with the acetone insoluble fraction 5.4 micrograms per cent and the other clinical symptoms improved during that period On a low intake of calcium averaging 1.065 milligrams per 3 day period there was marked loss of calcium (Table V and Fig 8) A reversal of the balance with moderate retention of calcium occurred in periods III and IV on a diet of high calcium content principally due to added milk During periods V VI and VII an uncontrolled diarrhea developed resulting in decreased

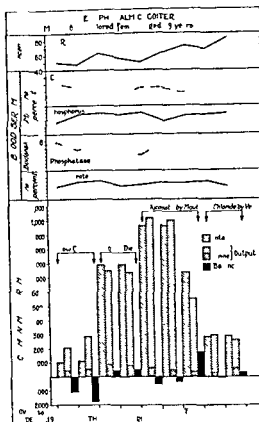


Fig 8 Intake of calcium chloride 3 times daily maintained retention of calcium in spite of the diarrhea

retention of calcium in spite of a high calcium diet supplemented by 10 grams of calcium gluconate daily by mouth The diarrhea continued during period VII even though only 750 cubic centimeters of milk was administered daily During periods VIII and IX the patient returned to the low calcium diet supplemented by intravenous administration of 10 cubic centimeters of 10 per cent calcium chloride three times daily which maintained a retention of calcium in spite of the diarrhea The blood calcium was slightly increased during period I (Table V) but ranged within normal limits on other determinations The blood phosphorus was normal on several determinations The blood phosphatase ranged from 4.4 to 7.9 Bodansky units and was definitely increased on few occasions The blood proteins ranged from 5.4 to 6.5 grams per cent

TABLE VI—DATA FOR D D \ 41819 WHITE MALE OF 27 YEARS WITH EXOPHTHALMIC GOITER

P	od	D pe od ta	V igh kgm	Calcium				D	Blood				BMR pe	R ma ks	
				Ou pu			I k gm.		Bala gm.	Serum cal m mgm pe ce	Serum hos- horus mum pe	Phos- ph tase Hodan- k un			T l pro m pe
				U gm	Feces gm	T tal gm									
Lo calcium d I 86 cal es with oo m p															
I	8	5	4.3	68	3.7	09	-	068	8	6		3.4	6.6	+4	B dres
II		3	2.4		666	09	-			6			6	+	
Hi b cal m d ppl m d w h i um lacta d d sd l b m h															
III		5		3.25	6	6.563	+0			5			6	+	600 regula
IV	7			3	5.436	6.68	+				4	6	5	+	milk w s alk fac 11 gm bl dal drope
H b cal m d l m d w h d cal m hos h h vios l b mou h															
V				5.6.6		8.8	+	2.4	2-			3		+	600 regu
VI			5	6	7.9		+	09			6			+	lk d t m. oepha b w dal
H b cal m d l m ted h l m hl d b															
VII	-6		3	07	4	09	+	5	-8			8		+	3 hl l ()
VIII	-9	5	268		5.8	09	+	6		3				+	ust t 600 d l lk

These findings illustrate the negative calcium balance found in exophthalmic goiter and the maintenance of a positive balance on a high calcium intake. They also reveal the development of calcium retention by the use of calcium chloride intravenously in spite of diarrhea.

D D No 4 889 a white male 27 yrs
t ed University Hospital No mb 94 fr
th m ngmt of gen e phthlm g t
H g h t r y f g d l d e l p m t f a g t
d in th p t 3 rs Th at d with
as d r v t b l t y phthlmo dy p
n a m l w kness s y fat gability occupa
t al f f i c v dysph g i a d c e d t l anc
t h a t t m r s f t h e t m t e s p l p t a n d
p u p e r s p t o n F n t l n d t m p o a l h d
ches also ccu d H mpla d l p i n s
k n e s n d t h c a l f t h g a d l g m c l e s H e
h d l t w g h t f m 57 t 7 p o n d s n t h y e
p t a d m n n p t f s a p p e t t
H h d h a d n m d e a l t t t t t m e n t f t h
d e a s

Phy cal min t l d w l l d v l p e d
b t p o l v h d n g m h f l
p e s that f t Th f w f l h d
S k w a m d m t Th w m k d
phthalmos th phthlmom t d g s f 3

m l l m t s b l a t a l l y A d f t h p l p e t a l
f i s e s w a s p n t A l a g f t h p p l d s a s t h
y e s f l l o w e d t h e f i n g e r d w n w a r d d e m
s t r a t e d D i f f i c u l t y o f c o e g e n c e e t e d T h p o
t r u d e d t g u e h d f i n e t e m T h k l
p u l t d p d l y d g m l y T h w a m d
t e d f s n l a r g m n t f t h t h y r d g l d f i c h
m v d n s w a l l o w n g A t h l l w p l p b l a d a
b r u t w a s h e r d b y c l t t t h g l a n d T h
h a t r t e w p d T h f i t r e m f t h
t e d e d d a b d c t d f i g r s
A d m s n r d b l d c o t w 548 000 w i t h t h
h m g l b n c o n t e t 4 g m p t T h w h t
t w a s 76 w i t h t t p h l 68 p n t h
l y m p h c y t e s 3 p t n d t h m c y t e s p e r
c t T h n a l y i s w g t T h e W a s r
m a d K h n t n s f t h b l o d w r e g
t T h e b a l m t a b l e t e w p l 545 p e r c e n t
w t h t h b l p l s e t e 88 t h e s p t r y r t z
t h e t m p a t u e 93 d g r F t h b l o o d p e s r e
34 s y t o l c d 64 d t o l c d t h w g h t 17
p o n d T h t o t l b l o o d d n N m b e r 3
w a s 63 m i c r g r a m p e c n t w t h t a c t
u n s l b l f t 7 m i c g r a m s p e t T h
b l o o d n t r g e n w m l l g r m p e r t h w d
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h l e s t e l 5 m l l g r a m p e t T h h p p c

acid ref net n test yield 3.9 grams Roentgenograms of the vertebral column showed lateral and knee joints and both hands showed slight decalcification.

Calcium and phosphorus metabolism studies were performed from November 18 to December 12, 1941. During the first 6 days a diet of low calcium content as given (Table VI and Fig. 9). A diet of high calcium content (Table VI and Fig. 9) principally due to addition of 600 cubic centimeters of homogenized milk daily was then administered supplemented by 3 grams of calcium lactate and 10 drops of drisdol (2500 units vitamin D) daily by mouth for 6 days. The high calcium diet as supplemented with 500 cubic centimeters daily by mouth for 6 days. During the last 6 days the high calcium diet was supplemented with 10 cubic centimeters of 1 per cent calcium chloride three times daily by vein.

A regimen of complete bed rest, adequate sedation and high calcium, high phosphorus, high vitamin and high calor intake as well as adequate iodization was later followed. On this regimen the basal metabolic rate decreased to plus 20 per cent on December 5 with the basal pulse rate 84, the temperature 98.6 degrees, the respiratory rate 14, the blood pressure 120 systolic and 68 diastolic and the weight 177 pounds. Bilateral subcutaneous thyroidectomy was performed on December 17, 1941, followed by a unilateral castration. Gross endocrinoscopic study showed diffuse hyperplastic goiter.

During our investigations on general management alone without iodine the patient improved clinically and the basal metabolic rate decreased from plus 45 to plus 31 per cent. The total blood iodine was 639 with the acetone insoluble fraction 151 micrograms per cent. The muscle and joint aches subsided. The basal metabolic rate further decreased to plus 20 per cent after adequate iodination. Much loss of calcium occurred on a low calcium intake (Table VI and Fig. 9). There was prompt response to added calcium in periods III and IV with a calcium retention of 75 mg. as much as 131 milligrams per period. Period V and VI showed a further increase in retention of calcium on a high calcium diet supplemented with wafers of dicalcium phosphate with viosterol. A still greater increase in the positive balance occurred in period VII and VIII on the high calcium diet supplemented by calcium chloride by vein. The blood calcium was found to be increased on 5 occasions (Table VI). The blood phosphorus was increased on one occasion (Table VI). The blood phosphatase was definitely increased (Table VI). The total proteins ranged within normal limits (Table VI).

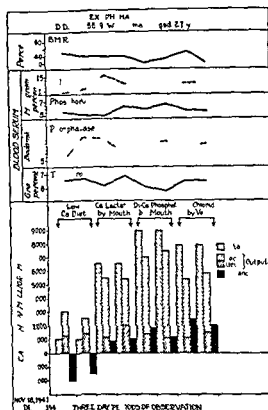


Fig. 9. This study gives data on the tests of calcium metabolism, phosphorus metabolism, and thyroidectomy. It also shows the response to calcium therapy with a marked retention of calcium and a reversal to a positive balance which is easily maintained on three different types of calcium.

This study again demonstrates the marked negative calcium balance in exophthalmic goiter on a low calcium intake. It also demonstrates the response to calcium therapy with a marked retention of calcium and a reversal to a positive balance which is easily maintained on three different types of calcium.

ANALYSIS OF STUDY

Gross disturbances of the calcium (Table I and Fig. 1) and phosphorus (64, 65) metabolism in hyperthyroidism vary greatly but are characterized chiefly by a grave loss of these elements both through the gastrointestinal and urinary systems when their intake is kept low or even optimum for normal persons. They are usually temporary preventable and reversible in character. They can readily be entirely controlled by ingestion or parenteral administration of adequate amounts of cal-

3,560 milligrams over a total period of 81 days remarkable retention of calcium resulted (Table VIII and Fig. 11). The state of the phosphorus metabolism (64) showed similar spectacular changes with much retention of the element as will be reported in detail in another communication (65). Retention occurred whether the extra calcium was fed (Table VII) or administered parenterally (Tables V and VI) and in face of a severe diarrhea (Table V and Fig. 8). In our series wafers of dicalcium phosphate with viosterol were instrumental in producing the most marked retention of calcium (Table VII and Fig. 10) when the amount of each drug was administered within reasonable limits of palatability. Dicalcium phosphate with viosterol also produced the greatest retention of phosphorus (64, 65).

The disturbances of the calcium metabolism due to hyperthyroidism are usually temporary in their effects on bones but at times and especially in long standing hyperthyroidism in the presence of insufficient calcium intake permanent pathologic changes of bone may occur which have so far not proved amenable to therapy of any type. Practically this far advanced stage can be best treated by prevention with adequate calcium and phosphorus feeding and early diagnosis and treatment of hyperthyroidism. Muscular joint and bone pains as well as myasthenia are associated frequently and have been treated successfully with extra amounts of calcium, phosphorus and vitamin D by others (50) as well as by us. One of our patients (M.H.) presented prominent musculoskeletal symptoms. Pain was so severe that she required morphine on several occasions. Myasthenia was of such intensity that the patient became bedridden. X-ray examination revealed slight

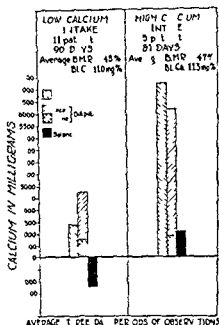


Fig. 11. Hypothyroid patients taking 5 g of these patients with adequate intake of calcium and phosphorus maintain the calcium level.

osteoporosis of the entire skeleton with moderate to severe osteoporosis of the left upper humerus (Fig. 4). Administration of adequate amounts of calcium and phosphorus resulted in retention of as high as grams of calcium and 12 grams of phosphorus daily (Fig. 5 and Table II). Within 8 days she obtained remarkable relief of pain. Movement of the shoulders became progressively better. The myasthenia decreased so that she was able to sit up in a chair. Orthopedic treatment has been at times used (9).

These studies reveal that ordinarily hyperthyroid patients require about 2 grams of calcium per day to maintain them in positive

TABLE VIII—EFFECT OF CALCIUM INTAKE ON CALCIUM METABOLISM OF SEVERAL CASES OF HYPERTHYROIDISM

Period (days)	Number of patients	Total days of observation	Calcium intake (g)	Average calcium intake (mg)	Average output (3 day period)			Average calcium intake (3 day period)	Average balance (3 day period)
Low calcium	High calcium	Low calcium	High calcium	Low calcium	Low calcium	High calcium	Total (g)	Low calcium	High calcium
Low calcium	High calcium	90	+	+	8	6	800	3	+
High calcium	Low calcium	+	+	+	3	5	6	20	+

calcium balance which is at least twice the optimum calcium requirement for normal adults. Phosphorus requirements are similarly increased (64). When it is realized that the average American diet is barely sufficient to supply the normal adult requirements then it is easily understandable that with the greatly altered metabolism of these two elements in hyperthyroidism grave depletion frequently exists which should indicate urgent need for the application of prophylactic and remedial measures.

Without adequate milk or cheese in the diet it is usually impossible to obtain the calcium required by hyperthyroid individual through food alone. We have found that milk is an excellent source of utilizable calcium and phosphorus for hyperthyroid patients when supplied in quantities of about one and one half quarts daily. In rare instances diarrhea is present so that no milk or smaller amounts as tolerated must be given and other forms of oral or intravenous therapy must be resorted to in order to supply the deficiency. It must also be remembered that utilization of calcium may be inadequate even with sufficient intake unless the factors which determine optimum absorption and utilization are maintained such as low fat and neutral or slightly acid balance of the diet and proper phosphorus and vitamin D intake.

Most hyperthyroid patients when seen by the physician have had symptoms for at least many days. In such cases and in cases in which calcium loss has been severe or has occurred over a long period of time such as in patients with obvious osteoporosis 3 grams of calcium daily is a more adequate dose. We suggest that the high calcium diet be then supplemented by adequate intake of some form of dicalcium phosphate with vitamin D in order to restore these lost minerals. This product in our experience seemed to promote the retention of calcium and phosphorus 200 to 1000 per cent over that of other forms of lime salt.

At the moment one of the best indication for calcium phosphorus and vitamin therapy is the necessity of managing some patients by nonsurgical means. This treatment constitutes an attempt to prevent the depletion and

tendency to osteoporosis which may occur even in hyperthyroidism of short duration. The patients included would be the inoperable case—those who refuse operation and those who for certain reasons are receiving thoracic usual medical therapy, roentgenotherapy or a combination of these forms of therapy. Calcium therapy is recommended for the reason that the number of failures in following these other methods of treatment varies but is usually high. Moreover significant decrease in toxicity is often not obtained for several weeks after beginning treatment.

With good medical management including a high calcium high phosphorus and high vitamin D intake but without iodine one may usually expect definite improvement in the general symptomatology including the tremor sweating irritability and hyperkinesia. When musculoskeletal symptoms referable to the loss of calcium and phosphorus are present they usually disappear. A maintenance of a good weight and a gain in strength a diminution in the tachycardia and a decrease in pulse pressure are often associated. Decrease in the basal metabolic rate usually occurs. When however iodine is then added there is often further clinical amelioration and further decrease of the basal metabolic rate. Calcium and phosphorus do have a definite place as replacement therapy in hyperthyroidism. On the other hand we do not advocate their use in place of iodine and the good general medical management used in the past.

In comparing the clinical course of those hyperthyroid patients since 1936 who have received adequate calcium phosphorus and vitamin D along with the older preoperative principles which we used to practice (adequate mental and physical rest adequate sedation a well balanced diet of high carbohydrate high protein high vitamin and high caloric content as well as adequate iodinization and treatment of existing complications) to that of patients treated prior to 1936 we have especially been impressed by the smooth postoperative course and absence of the so called hyperthyroid crisis in recent years. The postoperative reactions have been minimal and there have been no detrimental effects (64). Because of these observations recently we

have treated in the above manner without iodine variation the iodine resistant patients with exophthalmic goiter with impending thyroid crisis particularly following the prolonged administration of iodine. This regimen proved successful in introducing remission so that the patient was more easily and more quickly prepared for surgery. Similarly patients with severe acute spontaneous exacerbations of hyperthyroidism were more easily brought under control and more adequately and promptly prepared for surgery. Long periods of preparation or of hospitalization before operation were thus avoided by this method (64).

True thyroid crisis is one of the most dreaded and most alarming of the postoperative complications. It accounts for 25 to 50 per cent of the immediate postoperative deaths in many clinics. It still occurs in spite of iodization and often occurs in the patient who is refractory to iodine. The causes of refractoriness to iodine and of thyroid crisis remain unknown. The gland of these patients often however shows hyperplasia with thinning or absence of the colloid. These phenomena are associated with lack of involution of the hyperplastic gland. Most evidence points to the fact that iodine therapy produces remission of thyrotoxicosis principally by increasing colloid storage of active organic iodine compounds. This is well shown by histologic examination which reveals marked colloid involution of the gland as well as by iodine analysis (62) by radio iodine autography (45) and by radio iodine fractionation (46) of the excised gland which show a high content of thyroxine diiodotyrosine and inorganic iodine in the colloid.

In 1920 Kottman showed that calcium increased the viscosity of the colloid in the thyroid gland. Cameron pointed out that of tissues other than bone the thyroid gland has the highest concentration of calcium (30 mgm).

Abelin revealed that calcium has an inhibitory action on thyroxine. The studies of Hellwig (9) did not support the view that calcium has its effect through neutralization of thyroxine. He (30, 31) demonstrated experimentally that the hyperplastic thyroid stored much colloid during simultaneous high

calcium and high iodine feeding. Thompson (15, 76) showed in 1933 and 1936 that in rats on diets containing the same amount of iodine the blood iodine level was comparatively lower in the groups receiving additional calcium than in control. Later in 1934 Klein (38) was able to show that a high calcium diet promoted a greater storage of colloid during iodine therapy than with iodine therapy alone. It is this augmentation of the storage of colloid which may explain the therapeutic action of calcium in reversing an iodine resistant state to that of iodine remission and in preventing thyroid crisis. Further investigation of this problem is particularly necessary to determine the precise status of this regimen with regard to thyroid crisis to the iodine refractory state and to the effects of preoperative use of calcium phosphorus and vitamins. The optimal benefits of iodine are temporary and alone seldom constitute a satisfactory means of control. Up to date our method has been used in preparation for operation and not as an independent method of treatment. An investigation of our regimen alone without surgery is now under way to determine whether calcium prolongs the remission effect of iodine.

In spite of all our knowledge of the thyroid problem there is still much lacking in the medical treatment of hyperthyroidism. Witness the intensive studies made on thiouracil in an attempt to find a better method of treating these patients medically. Thiouracil therapy does result in retention of calcium phosphorus and nitrogen of hyperthyroid patients as shown by Sloan and Shorr and it decreases the blood content of the probably hormonal iodine fraction of the blood (19). It offers new hope of more effective medical control of hyperthyroidism (5). At the moment however it is too soon to predict whether this drug can be employed safely in the routine management of thyrotoxicosis. Unfortunately it has been found by several clinics that thiouracil possesses certain inherent dangers which do not allow it to be an ideal medicament. It is hoped that there will be discovered related drugs or new methods which possess the favorable action without the toxic side effect of thiouracil. While such new drug or new

method are being developed and are making careful clinical and laboratory studies of thiouracil in comparison to our method of preoperative preparation. It will probably take several years to determine the precise indications and limitations of these methods.

SUMMARY AND CONCLUSIONS

1 Calcium phosphorus and vitamin D medication is of undoubted value in the treatment of clinical hyperthyroidism. Especial attention must be given to calcium which in the usual diet is barely sufficient for a normal person. Hyperthyroid patients ordinarily require about 2 grams of calcium daily to maintain them in calcium retention. This is at least twice the optimum calcium requirement for normal adults. Three grams daily is a more adequate amount to restore the depleted calcium. Phosphorus requirements are similarly increased.

2 Eleven hyperthyroid patients maintained on a relatively low intake of calcium averaging 474 milligrams per day over a total period of 90 days showed an average loss of 4.9 milligrams per day. When five of these patients were further investigated on an adequate intake of calcium from different sources averaging 2,410 milligrams per day over a total period of 81 days remarkable retention of calcium occurred which resulted in a positive balance of 36 milligrams per day. The state of the phosphorus balance showed similar spectacular and beneficial changes. Retention occurred whether the calcium was fed or administered parenterally.

3 We supplemented our high calcium and high phosphorus diets with four of the most common types of calcium salt used in therapy. They were all effective in maintaining retention of calcium and phosphorus. However 3 of the 11 patients in our series received added amounts of phosphorus and vitamin D besides the added amounts of calcium in the form of dicalcium phosphate with viosterol. The latter seemed to promote increased retention of calcium of 200 to 1000 per cent over that of patients receiving only added calcium or calcium and vitamin D in palatable doses.

4 Hyperthyroidism in the presence of insufficient calcium and phosphorus intake often

produces definite osteoporosis which may be detected roentgenologically. Severe cases of osteoporosis may lead to osteomalacia and spontaneous fracture. Gross deformities and dwarfism may result. Practically these complications of hyperthyroidism can be treated by prevention with feeding of adequate calcium phosphorus and vitamin D and early diagnosis and treatment of the hyperthyroidism. In late stages orthopedic measures may be necessary.

5 Muscular joint and bone pain and other symptoms are often associated. These can frequently be best controlled by calcium phosphorus and vitamin D therapy.

6 Calcium and phosphorus along with vitamin D have no deleterious effects in hyperthyroidism. They have a definite place as replacement therapy. On the other hand we do not advocate their use to replace the sound medical methods of the past including iodination but rather as a supplement to them. When thus properly used preoperatively we have been impressed with the much smoother postoperative course.

7 True thyroid crisis is one of the most frequent most dreaded and most alarming of the postoperative hyperthyroid complications in many clinics. It still occurs in spite of adequate iodination and often in the patient who is refractory to iodine. We feel that preoperative calcium phosphorus and vitamin D are important in the treatment of the iodine refractory and the precrisis states as well as in the prevention of thyroid crisis. These clinical effects are being further investigated.

8 Adequate calcium phosphorus and vitamin D should especially be administered to all hyperthyroid patients who for some reason do not come to surgery early. The patients included are those who refuse operation inoperable cases and those who are being treated by thiouracil by older medical method by x-ray therapy or by a combination of these methods of therapy.

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THE POSTERIOR APPROACH FOR ARTHRODESIS AND OTHER OPERATIONS ON THE SHOULDER

PAUL H. HARMON, Ph.D., M.D., S. J. P. N. S.

THE relative inaccessibility of the glenoid face of the capula and the entire acromion from the conventional anterior approaches to the shoulder has led the author to use a posterior route for arthrodesis of this joint. Greater familiarity with the shoulder from this side has increased the frequency with which this method has been used for other operations. As a result of this experience the author believes the posterior approach to be optimal for (1) arthrodesis of the shoulder, (2) operations upon the superior and posterior aspects of the humerus such as replacement of tuberosity fragments and repair of certain types of rotator cuff lacerations, (3) operations for posterior dislocation of the shoulder and (4) all operations upon the glenoid except those demanding exposure of only the anterior portion. Familiarity with the posterior approach will increase the ability of the surgeon to demonstrate types of pathology in this joint other than those seen from the front. The author has used this method for shoulder arthrodesis in 10 cases, replacement of greater tuberosity fragments in 4 cases, for removal of exostoses on the posterior and inferior glenoid in 2 cases and for exploration of the shoulder joint in 1 case. This approach is not to be used for operation upon the coracoid, the bicep tendon and for most repair in the suprapinatus region.

The early surgeons approached the posterior part of the shoulder joint through a deltoid splitting route. This method fell into disrepute because of frequent injury to larger or smaller twig of the superior branch of the axillary nerve. This nerve and the branches of the supraclavicular nerve to the suprapinatus and the infra-pinatus should not be seen or damaged in any safe posterior approach.

McWhorter in 1935 described a posterior approach to the shoulder that has been the point of departure for the method described here. In Rowe and Yee have recently described a posterior approach for reduction and cure of posterior dislocation of the shoulder which differs only in certain minor detail from the technique described in this paper.

SURGICAL TECHNIQUE

The patient is anesthetized either on the side or in the 30 degree oblique position with the shoulder to be operated upon uppermost. The entire arm, axilla and posterior shoulder are prepared and draped. The usual precautions are taken not to expose excessive skin surface.

The skin incision begins at the middle of the scapular spine and extends along and just inferior to it outward to the region of the tip of the acromion. The posterior extent of the deltoid origin is noted. A subperiosteal dissection is then made of the portion of the deltoid originating from the spine of the scapula. The detached posterior deltoid is reflected laterally and inferiorly in the wound. Care is taken not to pull it below the level of the muscle belly of the teres minor and to keep instruments out of the muscle substance of the detached deltoid. Injury to the axillary nerve is thus avoided. The site of the dissection is shown in Figure 1 with the proposed line of incision in the rotator cuff and posterior joint capsule.

With the arm in neutral rotatory position a vertical incision is made through the tendinous portion of the rotator cuff. This incision can be made with impunity if properly placed in the tendinous portion and the operator keep away from the muscle belly of the teres minor and the quadrilateral space beneath it through which the axillary nerve emerges. The posterior joint capsule can then be separated from the peripheral tendinous

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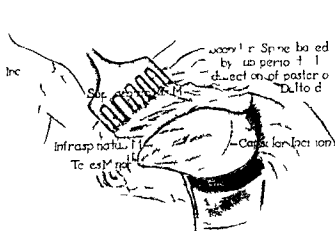


Fig. 1. Specific posterior approach.

strip of the rotator cuff and incised in any direction desired. Figure 2 shows the dissection at this stage. The approach at this level is practically bloodless, being through tendon and joint capsule. The exposure of the glenoid and head of the humerus is more extensive than by any other route except by the sabre cut method.

When an arthrodesis is performed the acromion is cut by transverse osteotomy, 2 or 2 1/2 inches from its tip and the latter is buried in a slot cut in the humeral head with the arm held in the correctly abducted position in the

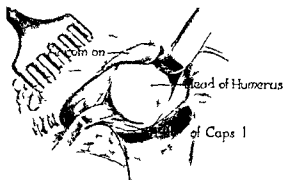


Fig. 2. Dissection of capsule.

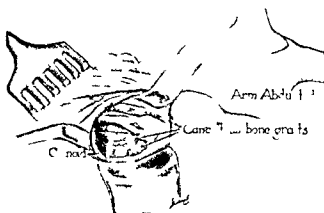


Fig. 3. Application of bone grafts for arthrodesis.

frontal plane. If bone grafts are used in addition they can be accurately laid on the denuded posterior glenoid and the humeral head as shown in Figure 3. Closure of the incision can be made by any type of suture material preferred by the operator. The whole arm, forearm, wrist and torso are then placed in a plaster shoulder spica that has been previously prepared.

If the operator keeps below the spine of the scapula and does not dissect in the muscle belly of the infraspinatus there is no danger that injury to the suprascapular nerve will take place.

SUMMARY

The surgical technique for a safe posterior approach for arthrodesis of the shoulder and other operations is described. Adherence to the technique as described keeps the dissection away from the muscle belly of the infraspinatus and teres minor and below the spine of the scapula will avoid injury to the axillary and suprascapular nerves.

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MASSIVE EXTRUSIONS OF THE LUMBAR INTERVERTEBRAL DISCS

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A GREAT deal has been written on the subject of the ruptured intervertebral disc but it appears that insufficient stress has been laid on the serious complications which may occur when this condition is inadequately treated. The extrusion of a large part of a disc may compress the cauda equina and cause weakness of one leg with disturbance of urinary function or even a transverse cauda equina lesion with paraplegia and incontinence of the bladder and rectum. Dandy has drawn attention to these serious cases and it has been casually mentioned by most of those writing on the subject of the ruptured discs. Most of the patients with the cauda equina lesions described in this article languished for days, weeks or months without a correct diagnosis being made. It seems proper therefore to discuss the symptom complex and to give detailed case histories as examples in order to shorten the patient's illness and perhaps obtain better results. The condition when severe constitutes one of the rare neurosurgical emergencies and like some other such emergencies the result in spite of prompt and effective treatment may be unsatisfactory.

The symptom complex was of variable degree of intensity from slight weakness of the leg below the knee with saddle hypesthesia and severe sphincter disturbances. In all 9 patients were seen of whom 8 were operated on and 1 died before anything could be done. They represent the serious complication seen in perhaps 300 consecutive cases of typical herniated nucleus pulposus with sciatica and without bladder symptoms or incapacitating weakness. In most cases there was a "cog wheel" history in that the picture developed in successive acute short episodes. Four of the verified cases were in men and 4 were in women.

It is of course quite impossible to generalize from such a small group of cases but there are one or two points which may be of interest and which may be significant. The age group of the patients seems to be between 35 and 45 years. All but 1 had a history of backache for years and all but 2 had a history of both backache and sciatica for years. A history of trauma was obtained in 3 patients, no history of trauma was obtained in 3 patients and in the other 3 there was an incident which might be described as trauma for instance a severe sneeze or cough. As in the case in other types of root involvement most of the patients had pain on coughing and sneezing. The bladder mechanism was not seriously involved in only 1 case. Intermittent symptoms were characteristic as was the "cog wheel" history of gradually progressive spurts of trouble.

With regard to the signs presented it may be said that they are those to be expected from pressure on the cauda equina. Weakness and hypesthesia were observed in varying degrees though rarely bilaterally symmetrical. The Lasque sign¹ was positive in all the cases in which it was tested. 8 cases. The deep reflexes in the ankle were affected in all the cases and the knee jerks were involved in some or paralyzed in others depending on the level of the compression of the nerve roots. Six of 8 of the patients had a tender spine on deep pressure. Five of 9 of the patients showed a narrowed intervertebral space at the site of the herniation of the involved disc. Spinal fluid examination was not significant except for block or partial block when below the lesion and for the reverse Queckenstedt test. In 1 case (Case 2) the total protein was high.

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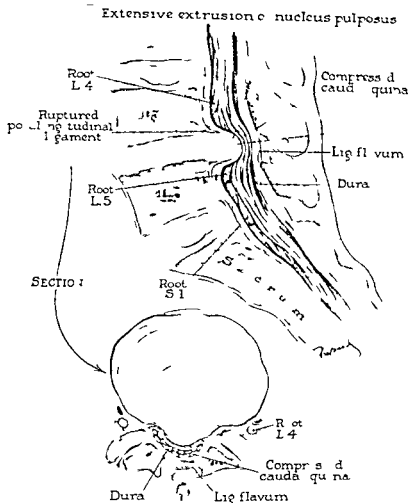


Fig. 1. Schmitt, D. Int. J. Orth. and Traumat. 1958, 3, 1. (Reprinted by permission of the publisher, J. B. Lippincott Co.)

although the fluid was removed from above the lesion but the test was done under circumstances in which there was the possibility of error.

The location of the extrusion was at the lumbosacral joint in 3 cases between the 4th and 5th lumbar vertebrae in 1 case and between the 3d and 4th lumbar vertebrae in 2 cases (Figs. 1 and 3).

DIAGNOSIS

The diagnosis of a condition such as this may be rather difficult but a usual careful

consideration of the history and of the physical and laboratory findings led to a correct conclusion. The first case in this group was not properly diagnosed and neither was it very well worked up from the point of view of a ruptured disc. Appropriate tests were made for a spinal cord tumor which in a sense it was. There was so little sensory change as compared to the extensive and marked motor weakness that a variety of tests were entertained. However the three cases all received a correct preoperative diagnosis including that in which the formatory para-

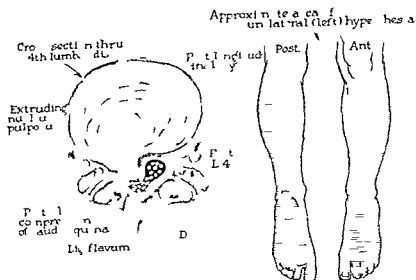


Fig. 1. Scheme of the experimental setup for the study of the effect of the frequency of the external magnetic field on the properties of the plasma.

tion was performed. Prior to consultation various diagnoses were considered ranging from multiple sclerosis through syphilis to listeriosis disease of the spine and metastases to the spine. Although these erroneous diagnoses constitute the main reason for drawing the attention of the profession to this condition, little difficulty need arise with regard to multiple sclerosis or syphilis. However the possibility of metastases to the spine must be carefully distinguished from the condition under discussion. In both there may be a short history of pain in the back with pain down the legs followed closely by weakness and sphincter disturbance. The histories are dissimilar if carefully taken in that the ruptured disc comes on in one or two or a series of incidents (e.g. wheel) whereas the metastatic lesion as a rule presents a steadily progressive history. In attempting to judge between the two a search should be made for a primary focus or a history of an operation in which a malignant tumor may have been present. The consideration combined with a careful study of the x-ray picture of the spine will usually bring about the correct diagnosis. I have seen and operated on 2 patients with metastatic lesions of the crura equina in whom nothing significant was seen in the roentgen pictures before

operation. One of the patients had had a breast removed 3 years before but the tumor contained in it was not thought to be malignant. In this case a neurological colleague advised operation on the basis of the probability and certainly possibility of a ruptured disc. In both cases the chest and spine films were considered to be negative. Pott's disease only occasionally causes cauda equina signs and symptoms but the history is short a few days to 2 or 3 weeks as in metastases to the spine. Here again the x ray films of the spine may not help for tuberculous granulation tissue may form and compress the spinal cord without producing significant changes in the x ray film. Spinal cord tumor must receive consideration but the shortness and jerkiness of the history compared to the extent of the disability make this diagnosis very doubtful. Certainly in this series except in the first case the diagnosis was not seriously entertained. Several other points help in establishing the likelihood of finding a ruptured disc. The spine is often tender in the region of the disturbed disc. Tenderness of the spine is not conspicuous in cases of innocent tumor of the cauda equina but in the case of malignant disease the spine is tender. The positive Lascaud sign is quite helpful for it is uncommon

on the right in the musculature below the knee
 with some trophic The knees were normal
 and the ankle jerks were not induced The Lasèque
 sign was positive on the left and negative on the
 right The 5th lumbar spine was tender The evas
 a saddle hypesthesia (minus 2) to the popliteal fossa
 sides and fairly symmetrical with the 5th lumbar as
 the most intact segment The bladder was distended
 tenderness of the sacral plexus was evident by
 normality of the spinal puncture was not done A diag
 nosis was made of an intradural extramedullary
 at the lumbosacral joint

at the 1 m p c r a j o i n t

Th per tion c n s i s t e d o f th rem l o f the
lam nae f th 4 th n i 5 th l m l a r t e l r a D i s c
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a s p e c t s o f t h e d u r a l e r t h 5 t h l m l a m
W h e n t h e 4 t h l m l a w a s r e m e d a p o j e c t n f r m
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f r o m b t w e n t h 4 t h a d 5 t h l u m l a r e r t b a
a n d t h e t n e d s p a l l y d w n w a r d n d p o s t e r
l y T h e l a r g p e c e s f d c t s e w r e s i l e
m o y d

The patient had an uneventful postoperative recovery and has been feeling fine. The leg gradually became stronger as yet by no means normal ($2\frac{1}{2}$) years later. The patient acquires a rubbery quality stepped to his legs because of scars and unexpected double growth. There is a hypesthesia in the plantar surface of the feet. There are some posterior bulging of the dura opposite the space between the fourth and fifth lumbar vertebrae. It was noted on serial exposure that it consisted of the old disc lesion.

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left Th knee j k ankle jerk a d hamstri g l ks
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ti The 3d lumbar spin as ten le There was
i continenc f ine Ther w s severe pain on
c ough g

Serial spinal punctures were done and normal appearing spinal fluid was obtained between the 1st and 2d lumbar spaces but fluid was not obtained between the 3d and 4th lumbar spaces. The total protein of the fluid was 53 milligrams per 100 cubic centimeters. The x-ray pictures show a narrow interpediculate distance between the 3d and 4th lumbar vertebrae. A diagnosis was made of an extruded disc between the 3d and 4th lumbar vertebrae.

Immediate operation is undertaken and consists of removal of the laminae of the 2d, 3d and 4th lumbar vertebrae. A mass of fat protruding from the anterior aspect of the spinal canal between the 3d and 4th lumbar vertebrae. This is removed extracranially in the large incision and seemed to constitute the entire nucleus pulposus in this region. The posterior ligamentum was torn; a ligamentum denticulatio and only a small part had protruded through it but the rest was again in the spinal canal under the lamina. The ligament had been lifted off the posterior aspect of the vertebrae.

The patient made a good recovery from the operation. He has no pain and he can use his bladder but he cannot walk at all till the anesthesia.

CASE 6 R T 35 year 11 hite f male was
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It was difficult to estimate the amount of loss in the leg because of pain. There appeared to be a knee plus a in the muscular belly the knee no one slight weakness about the joint could not walk there as continued to function as before. There was an anesthesia in the adductor and in the leg corresponding to a lowest intact segment in the thigh lumbar. The Lasague sign positive on both sides. The all the signs as tender. The knees were normal but both the knees were abnormally firm. The pain showed more near the terv. Traispace the lumbar canal spinal pressure was not done. Diagnosis: mild advanced intervertebral disc at the lumbosacral joint on the left.

The peration on August 31 194 consisted of a unilateral approach to the lumbo-cranial joint. Nothing was found at the point but a firm growth of ligamentous mass between the 4th and 5th lumbar vertebrae was felt. After a great deal of

LUNG ABSCESS

An Analysis of 244 Cases

ANIBAL ROBERTO VALLE M D Ch l t l l e V r g n a

IN this paper we attempt to analyze the more important features of 244 cases of lung abscess from the record of chest service Barnes Hospital and St. Louis Children's Hospital St. Louis Missouri during a period of 12 years from 1931 to 1943 inclusive. In spite of the advances made in the treatment of other diseases of the chest the methods so far devised for the treatment of lung abscess are not wholly satisfactory.

CLINICAL FEATURES

Differential diagnosis The differential diagnosis between lung abscess bronchiogenic carcinoma tuberculosis bronchiectasis interlobar empyema and secondarily infected cyst of the lung is important. Tuberculosis can be ruled out by repeated sputum examinations for tubercle bacilli in direct smears concentrations culture and guinea pig inoculations. In this distinction the onset of the disease is of consideration because tuberculosis seldom starts as an acute ailment. The secretion from lung abscess is foamy watery brownish and foul smelling as a rule and that from tuberculosis is very thick usually green and odorless.

To differentiate between simple lung abscess and carcinoma is more difficult because often there is a combination of the two resulting from an infection of the carcinoma. The x ray picture in bronchiogenic carcinoma often shows atelectasis of one lobe and a not well outlined shadow. Some cases of carcinoma develop pleural fluid in which carcinoma cells can be detected. We believe that the best means of differentiating between the two is bronchoscopy which in the case of bronchiogenic carcinoma will generally reveal the growth blocking the bronchus from which a biopsy can be taken. Sometimes the bronchus can be seen to be compressed from without.

In a few cases the tumor may be out of reach of the bronchoscope and an accurate diagnosis cannot be made until an exploratory thoracotomy is performed.

In cases of bronchiectasis complicated by lung abscess the long history and lipiodol bronchograms are valuable in differential diagnosis.

The distinction between interlobar empyema and lung abscess can be made by the fact that in the early stages of the empyema the patient does not cough or bring up any sputum. If the empyema opens into the bronchial tree and drains through the bronchus the patient has a cough productive of purulent and usually odorless sputum. The x ray picture of empyema shows a well demarcated shadow located in a fissure area.

Diagnosis often can be made between infected cysts of the lung and lung abscess. Usually there is more than one cyst in the lung and all of them are not infected. The infected cyst generally reveals on the x ray film a fairly sharp outline with thin wall as contrasted with the poorly defined outline of the ordinary abscess.

Location It is generally believed that the majority of lung abscesses are located in the lower lobes a belief borne out by the findings in our cases. This opinion favors the aspiration theory of the etiology of lung abscess. From a review of the literature on lung abscess this belief seems justified even though in some series of cases it has been reported that the upper lobes were more often involved than the lower. Cutler and Gross found the largest number of abscesses in the upper lobes and Flick and associates reported the same findings. On the other hand Freedlander states that the predominant sites are the apex of the lower lobe posteriorly and the lingula. Lueth and Sutton point out that they found the greatest number of abscesses in the right middle and lower lobes. In our patients the

right lower lobe was found the more common site of the abscess the next most common site being the left lower lobe followed in order by the right upper left upper and right middle lobes. Also included in this report are 6 cases of bilateral lung abscess.

TABLE 1—DISTRIBUTION OF ABSCESS IN OUR SERIES OF CASES

Location	N	Perce
Left upper lobe	9	7.5
Left lower lobe	49	
Left upper and lower	4	5
Right upper lobe	37	5.7
Right lower lobe	7	43.8
Right middle lobe	3	5.5
Right middle and lower	4	5
Right lower and middle	5	9
Right middle and lower and left lower	3	3
Right lower and left lower	3	3
Total	44	

Etiology and pathogenesis For many years there has been a great deal of discussion about the etiology of lung abscess. The opinion is divided as to whether it is produced by aspiration or by embolism. Cutler and Gross and Schleuter and Weidlein in support of the embolic theory cite the difficulty in producing abscess experimentally through the bronchi. They state that abscess occurs following local as well as general anesthesia and that in the majority of cases considerable time elapses between the operation and the development of the abscess. In their experiments with dogs they were able to produce abscesses consistently by using infected emboli. It is of interest that these abscesses healed quickly except when the emboli used were infected with pyorrhea scrapings in which cases chronic abscesses were formed containing anaerobic and aerobic organisms. Dogs however are not good animals in which to produce abscess through the bronchi because of the horizontal position of the bronchial tree and the great resistance of the lung tissue to infection. Nevertheless more or less constant results have been obtained by introducing pus from lung abscesses containing various organisms such as pyrochetes fusiform bacilli aerobic and anaerobic cocci when such material blocks the bronchus mechanically causing an area of atelectatic tissue with low resistance to infection. Occasionally in this manner chronic

abscess can be produced in the atelectatic area. Dr Duff Allen made the important experimental observation that it is not necessary to block the bronchus if the pus from a human lung abscess is immediately introduced into the bronchial tree of the dog while it is still warm. The organisms responsible for the production of pulmonary abscess are apparently very susceptible to cooling. Even if they are allowed to cool to room temperature they lose their ability to cause lung abscess in the dog unless the bronchus is simultaneously obstructed. This important observation of Allen's once and for all clearly showed that aspiration of suitably infected material can produce a lung abscess even in the absence of an obstruction.

It is the consensus that the difficulty in producing abscess via the tracheobronchial tree is due to the cough reflex and normal action of the cilia. This same is true in man and probably accounts for the infrequent development of lung abscess despite the frequent aspiration of infected material into the lungs.

Many authors support the aspiration theory by pointing out the increased frequency of occurrence of lung abscess following tonsillectomy and tooth extraction especially with highly infected gums and when ether anesthesia is used which increases the production of mucus and decreases the cough reflex. It is also emphasized that abscess occurs less frequently when the patient's head is kept lowered during the operation.

In our series we found that 41 lung abscesses developed after tonsillectomy under ether anesthesia and 27 after abdominal operation under general anesthesia. Myerson subjected to bronchoscopy a number of patients who had had tonsillectomies performed under general and local anesthesia and found blood and mucus in the lower bronchi in 90 per cent of the cases with general anesthesia but found it in a much lower percentage among those having local anesthesia and cough reflex present.

In 157 or 63 per cent of the cases in this series lung abscess was said to have followed pneumonia. Although during pneumonia the bronchus or bronchi probably become blocked by thick mucus which causes atelectasis in

the plunged off area and thus initiates favorable conditions for the development of an abscess the statement of the patient or even of his physician that the condition had its origin in an attack of pneumonia should be accepted with caution. Every lung abscess begins with a localized pneumonitis which often is considered to be a lobar pneumonia. As stated by Fisher and Finney, if virulent pneumococci are in the bronchial secretions lobar pneumonia will result but if anaerobic organisms of the mouth are present a lung abscess or gangrene might result. As stated before normal lung tissue is highly resistant to infection but atelectatic tissue is easily infected. This viewpoint is expressed by many writers in recent literature.

Other causes of abscess in our series were aspiration of foreign body, subphrenic abscess, congenital cystic disease, encephalitis in 1 case and in 7 cases the cause was unknown.

In our 36 cases of lung abscess among children 8 cases or 3 per cent were caused by aspiration of a foreign body. None of the abscesses in our adult patients was caused by aspiration of a foreign body.

TABLE II—CAUSES OF LUNG ABSCESS IN OUR SERIES OF CASES

Cause	No.	Per cent
Pneumonia	4	6.8
Pneumonia (gangrenous)	5	6
Foreign body	8	3
Subphrenic abscess		
Pulmonary		
Post-encephalitic		
Congenital cystic disease		
Unknown	7	
Total	44	

Bacteriology. In our cases cultures were taken preoperatively from the sputum from material obtained by bronchoscopy and postoperatively from material obtained directly from the abscess. It is difficult to determine the exact bacteria causing the abscess because in most cases there is a combination of two or more types. Both aerobic and anaerobic bacteria are found in lung abscess cultures as are also facultative anaerobes. According to Varney aerobic organisms first invade the healthy tissue and prepare the way for further damage by the anaerobic organisms.

The flora found in lung abscess is remarkably similar to that found in the mouth especially in a mouth with infected gums.

In our series pneumococci were found in 18 per cent of the cases. *Staphylococcus aureus* in 1, per cent. hemolytic streptococci in 14 per cent. *Micrococcus catarrhalis* in 12 per cent and pirochetes in 5 per cent.

D. T. Smith has found fusiform bacilli and pirochetes associated with anaerobic streptococci and vibrios in the wall of the lung abscess and with that combination produced abscess experimentally in animals. Some writers consider that the pirochetes and fusiform bacilli are secondary invaders also that they are an important etiologic factor in the chronicity of the abscess and that they probably contribute to the foul odor of the sputum and bad breath.

Philip Varney made a noteworthy study of the bacteriologic factors causing lung abscess. He emphasized the importance of searching for anaerobic as well as aerobic organisms. In his series of cases he found *Bacillus melaninogenicus* in 94 per cent of the cases. He also found that the cultures of this organism had the very foul characteristic odor of putrid lung abscess and that the strength of the odor increased with the number of these organisms present. His findings show that the chief organisms concerned with this process are *Bacillus melaninogenicus*, fusiform bacilli, pirochete and streptococci especially of the viridans type. In the present series cultures for *Bacillus melaninogenicus* were not made.

TABLE III—ORGANISMS FOUND IN CULTURES MADE ON CASES IN OUR SERIES

Organism	No.
Pneumococcus	7
Staphylococcus	9
Fusiform bacilli	7
Hemolytic streptococcus	4
Micrococcus catarrhalis	
Spirochetes	5
Streptococci	5
Infusoria	
Others	

Symptoms and signs. Almost without exception cough is present in all cases of lung abscess and is the earliest symptom usually being dry at first and becoming productive

later. At first the sputum is meager but in creases and often becomes foul as the abscess progresses. Many types of sputum are found in abscess patients: odorless purulent sputum, mucoid sputum, blood streaked and thin, foamy, brownish colored, foul sputum. In our cases 88 per cent had foul sputum and 11.4 per cent had odorless sputum.

Hemoptysis occurred in 57.8 per cent of our patients with lung abscess and these results are consistent with results of other writers. Hick and associates reported hemoptysis in 45 per cent of their patients. Warner in 54 per cent and Fisher and Finney in 20 to 40 per cent of their patients.

In about 90 per cent of our patients we found chills and fever present. Ninety-four per cent of the patients had chest pain of the pleuritic type as an early symptom. This symptom is an important consideration in patients who are to have surgical drainage because this is sometimes an indication that the pleura is adherent in the abscess region, thus increasing the possibility of a one stage operation.

On physical examination we found in many cases foul breath, pyorrhea and dental caries, dullness to percussion, suppressed breath sounds and râles over the abscess area. The breath sounds varied from bronchovesicular or tubular to amphoric when the cavity was large, superficial and empty. It is worthy of note that some of our patients exhibited no pulmonary symptom. Also it was observed that in some cases the symptoms varied from time to time. For instance at one time there might be chest symptoms and on the next examination no symptoms at all. We found clubbing of the fingers and toes occurring more frequently in chronic cases than in acute cases. With reference to the laboratory examinations in acute and subacute cases we found frequent leucocytosis and in the chronic cases frequent anemia.

It goes without saying that a ray examination is important in the accurate localization of the abscess. If sufficient time has elapsed since the onset of the trouble one may see that the x-ray picture has changed from that of an ill defined area of pneumonitis to one of sharper demarcation and then to that of a

cavity with a visible fluid level. It is not advisable however in most cases to wait for this development to occur before treatment is instituted. Of course the localization of the abscess will be facilitated by the making of films in different positions. We find lipiodol of little use in localization of abscesses because it seldom enters the cavity itself.

Age and sex. Of our 244 cases 208 were adults and 36 were children. The average age of the adult patients was 35.9 years and the ages of the children varied from 1 month to 13 years, the greatest number of patients being between the years of 5 and 10. Of our cases 154 were male and 90 were female.

Duration of disease. The duration of disease in our cases ranged from 3 weeks to 19 years. In this report we have considered as acute cases those of no more than 2 months duration. All cases lasting more than 2 months we have considered as chronic, the average duration being 1 year. We present 110 acute cases of which 63 patients had surgery and 47 had no treatment other than bronchoscopy, and 134 chronic cases of which 101 patients had surgery and 33 had nothing except bronchoscopy.

TREATMENT

Prophylaxis. Prophylaxis is of great importance in any discussion of lung abscess. Good care of the teeth, gums and throat is imperative before any contemplated operation especially one of the upper respiratory tract. It is also important in operations in which deep and prolonged anesthesia is necessary in which case the production of mucus is increased and the cough reflex is diminished sufficiently to permit aspiration into the smaller bronchi. Sometimes the material aspirated in this manner is thick enough to plug the bronchi thus causing atelectasis or is infected with pus producing cells from the mouth or other organisms from the upper respiratory tract causing secondary infection.

Strong sedatives should not be used before and after operation because they decrease the cough reflex and facilitate the retention of the secretion in the lower bronchi.

One of the most important steps in post operative prophylaxis is the frequent aspira-

tion of the bronchial secretions and vomitus if present in the trachea by nasal catheter. Inhalation of oxygen and encouraging the patient to cough after operation are two other prophylactic measures.

Medical treatment. Nonsurgical method of treating lung abscess except bronchoscopic aspiration have been largely discarded because they are ineffective and because they lead to delay in the performance of surgical drainage. Some abscesses however become healed spontaneously by breaking into a bronchus and thereby accomplishing the same effective drainage which the surgeon aims to create by external drainage. But this fortunate result is not to be expected. In general a lung abscess that seems not to be draining itself adequately through a bronchus should have external drainage as soon as the diagnosis has been established. Neuhof's writings on this subject which will be discussed more extensively later have had great influence in changing our conceptions. It is always possible of course that some specific agent against the infecting organisms may be discovered which will reduce the necessity of surgical interference. But apparently that agent is not yet at hand. Penicillin seems to be helpful in some cases but not in most.

In all our lung abscess cases postural drainage was given a fair trial as treatment except in those cases with abscesses located in the upper lobes. We start the patient on postural drainage for 5 minutes and increase the time gradually to 30 minutes. The patient is put on a specially built postural drainage table from two to three times daily with the table tilted to a 45 degree angle. We encourage the patient to cough and expectorate during these periods. Sometimes this procedure coupled with bronchoscopy cures the abscess without surgical intervention.

Bronchoscopy. Most of our bronchoscopies are performed under avertin anesthesia administered rectally 85 milligrams per kilogram of body weight. In poor risk patients or patients with severe heart conditions we use local anesthesia pontocaine per cent.

Of our patients 92 per cent have had either one or more bronchoscopies. We consider this one of the most important feature in the

diagnosis and treatment of lung abscess. In 80 patients treated only by bronchoscopy 4 were improved.

As a diagnostic procedure it is very useful in localization of the abscess by revealing which bronchus is the source of the pus. It is invaluable in making a differential diagnosis between a simple lung abscess and one associated with a carcinoma. In our experience an occasional patient exhibits the symptoms of a lung abscess which is only a complication of a bronchiogenic carcinoma. The tumor blocks the bronchus and causes an area of atelectasis followed by a lung abscess the symptoms of which predominate. On bronchoscopy the tumor is revealed and changes entirely the aspect of the treatment of the case.

As a part of the treatment bronchoscopy is much used. Sometimes the draining bronchus becomes plugged and by introducing the flexible suction tip into the bronchus the mucus plug is removed and drainage promoted. As before mentioned it is used as a means of keeping the bronchi open to facilitate postural drainage. We do cauterization through the bronchoscope to remove the granulation tissue which sometimes forms and blocks the bronchus. This procedure also aids in draining the abscess through the bronchi. Patients in bad condition can often be so greatly improved by several bronchoscopic aspirations that the later surgical drainage becomes less hazardous.

We consider bronchoscopy imperative whenever aspiration of a foreign body into the bronchial tree is suspected.

Surgical treatment. Neuhof and Touraiff have suggested early one stage surgical drainage in acute lung abscess considering as acute abscesses of not more than 6 weeks duration from time of onset of first symptoms. As basis for the soundness of this suggestion they state that from observations at operations and autopsies the lung abscess cavity exists within 1 week or 10 days of the onset of infection. The lesion is usually superficially located in the lobe and adhesions develop very early in the disease which facts make possible a one stage operation. At early operation they state they find a solitary unilocular lesion associated with walling off pleural adhesions.

By early operation the possible complications of spread of infection by spill-over fibrosis of surrounding pulmonary parenchyma formation of multilocular cavities and bronchiectasis are avoided. Also there is less chance of development of metastatic abscesses in other parts of the body particularly in the brain and amyloidosis. The results obtained by them justify their recommendation of early operation since they report a series of 122 operations for acute lung abscess with a mortality rate of 3.27 per cent.

The majority of our patients had reached the chronic stage when they came to us for treatment. We have found that external drainage of the abscess is the most effective surgical treatment for lung abscess. In this treatment accurate localization of the abscess is an important factor to ascertain the point where the abscess is closest to the parietal pleura which determines the approach. When the site of operation is decided an incision varying from 10 to 15 centimeters in length is made along the ribs to be resected. We resect as a rule two ribs subperiosteally in about 10 centimeter lengths. The position of the patient on the operating table depends upon the side to be operated upon and the localization of the abscess. The majority of our patients were operated upon in the horizontal position with the side to be operated upon uppermost. In patients in whom we expect to find several bronchial fistulas we place the patient in a semi sitting position to keep the secretions in the lower bronchi during the operation and from plugging the major bronchi to prevent suffocation.

We use general anesthesia in all cases but at times use avertin as an induction anesthesia. We use either nitrous oxide or intravenous pentothal.

In this series we used the actual cautery to unroof the abscess cavity. This procedure was carried out in one or two stages depending upon whether or not the lung was adherent to the parietal pleura. At removal of a section of the rib overlying the abscess it can be readily seen whether or not the lung is adherent to the parietal pleura or moves freely beneath it. In cases in which the pleura is not adherent the operation must be done in two

stages. In our series we found a two stage operation necessary in 50 per cent of the cases. At the first stage we pack the rib beds with either acriflavine or iodoform gauze to create adhesions. We allow the pack to remain in place without changing from 10 days to 2 weeks.

When the pleura is found adherent we use needle aspiration in order more accurately to determine the real position of the abscess after which by means of cautery the abscess cavity is widely unroofed. All necrotic tissue and pus are aspirated by suction. After it is unroofed the cavity is tightly packed with acriflavine gauze and then a dry dressing is tightly applied. We let the pack stay in place from 4 to 5 days at which time it is changed under general anesthesia intravenous sodium pentothal. The second change of the pack can be made under morphine hypodermically without too much discomfort to the patient. Thereafter the pack is changed every other day and packed more loosely in order to give the lung a chance to re expand.

When the abscess is located near the periphery of the lung and is open into the pleural space with subsequent empyema we do a thoracotomy drainage with rib resection. Occasionally when the chest is opened it is found that the opening through which the abscess drains into the pleural space is not large enough and we enlarge this opening with cautery. The pleural cavity is drained by means of a large rubber tube. This operation is performed under the same anesthesia as we use for cautery. The patient is placed in the semi sitting position because so many bronchopleural fistulas are present.

TABLE IV — TYPES OF OPERATIONS PERFORMED AND THE NUMBER OF CASES HAVING EACH

Operation	No.
Cautery	97
Thoracotomy	37
Lobectomy	8
Intercostal drainage	2
Total	64

We do lobectomy for lung abscess in cases in which the cavity does not heal completely and the bronchopleural fistulas are still present 6 months or more after the cautery opera-

tion is performed. If however any active infection is present lobectomy is a dangerous operation. In this series 28 cases of lobectomy for lung abscess are included. The lobectomy is performed under cyclopropane intratracheal anesthesia with the patient in the horizontal position with the side to be operated upon uppermost. We never start the operation until 5 per cent glucose in saline or distilled water is running intravenously. Shortly after the operation begins we start blood transfusion. In the average case the patient is given routinely a transfusion of 500 to 1000 cubic centimeters of whole blood. The postero-lateral incision is used and the 6th rib removed subperiosteally. In chronic lung abscess cases because of the many adhesions and the presence of scar tissue the dissection of the hilar structures is either so difficult or impossible in some cases that mass ligation of the hilus is the only safe procedure. Of the 28 lobectomies reviewed in this series we used individual ligation in only 7 cases. We routinely drain these patients with two rib resection drainages, one in the posterior axillary line through the 7th or 8th rib and one in the mammillary line through the 6th or 7th rib. We keep this procedure as a closed drainage from 10 days to weeks and then use open drainage. In patients with lung abscess and secondary bronchiectasis with copious bronchial secretions bronchoscopy is carried out before and after the operation.

We also have 2 total pneumonectomies for lung abscess in this series in which there were multiple abscesses involving the entire lung.

Postoperative complications. One of the most serious postoperative complications in lung abscess is hemorrhage. The use of the cautery makes hemorrhage less likely to occur and we found that tightly packing the opening after the operation helps to prevent hemorrhage in many cases.

Occasionally a complication is caused by spillover of pus into the healthy lung tissue. Sometimes this has caused involvement of the opposite side blocking the bronchus and spreading the disease. This mishap can be avoided by frequent aspiration of secretions and encouraging the patient to cough during the early postoperative period.

Whenever the abscess is close to the pericardium and the cavity ruptures into the pleural space and bronchopleural fistulas are present empyema occurs. We found in our series 4 cases of preoperative empyema. As a postoperative complication it is a rare occurrence because we exercise much care to see that adhesions are present before drainage is attempted. When the empyema occurs the patient usually develops an anaerobic infection of the pleural cavity which requires adequate drainage and changes the prognosis in the case for the worse.

Another complication worthy of consideration is septic spread of the disease to other parts of the body. These abscesses exhibit the same type of pus, the same odor and the same bacteriological flora. In our series we found sometimes metastatic abscesses even in the abdominal wall and in the lower extremities. Two frequent sites are the kidneys and the spleen.

Brain complications. Sixteen or 5 per cent of the cases had brain complications. Nine were proved brain abscess cases, 4 were doubtful and 3 had cerebral embolisms. In only 1 case was an operation for the brain abscess performed and this was unsuccessful. In 1 case the lung abscess followed a craniotomy.

In many of our cases bronchopleurocutaneous fistulas were present after operation. Often they close spontaneously but when they remain for long periods of time they require lobectomy, plastic operation such as muscle graft or Schede thoracoplasty.

RESULTS
TABLE A—RESULT OBTAINED IN
OUR PATIENTS

Res	ses	g	l	d	g	l	P
Mortality	es	g	l	d	g	l	74
Imped-	gical	d	gical				74
Mortality	urg	ases					35

It is very difficult to state just what type of treatment is best for lung abscess because there are so many variable factors to be considered in each case. The success of the treatment depends upon the duration of the disease prior to operation, the patient's general condition, the etiology of the disease, the bacteriological flora and the location of the abscess.

In our series 164 patients had surgical treatment and 80 patients had no surgical treatment. Of the patients treated by bronchoscopy only 61 per cent were improved and the mortality rate was 20 per cent. In those having surgery 62 per cent were improved and the mortality rate was 38.8 per cent. In the series as a whole the over all mortality rate was 27 per cent with 73 per cent of the patients improved.

SUMMARY AND CONCLUSIONS

In this paper we have presented a review of 144 cases of lung abscess, some of which were treated surgically and some nonsurgically. We make no attempt to prescribe any definite method of treatment for lung abscess but in these conclusions present some facts found in our series of cases which we consider worthy of note.

1. A precise localization of the abscess is very important in determining the method of approach in cases in which surgery is contemplated. X-ray examination and bronchoscopy are particularly useful in this respect. In our series the most prevalent site of the abscess was the right lower lobe, the next the left lower lobe, and the next the right upper lobe.

2. Forty-one abscesses developed after tonsillectomies and 27 after abdominal operations, all performed under general anesthesia and most of them under ether. In 23 per cent of our cases in children lung abscess was caused by aspiration of a foreign body.

3. In cultures of sputum material obtained by bronchoscopic aspiration and the material from the abscess itself we found both aerobic and anaerobic organisms. Pneumococci were most frequently found and less often Staphylococcus aureus, fusiform bacilli, hemolytic streptococci, micrococcus catarrhalis, etc.

4. In regard to symptomatology we found the earliest and most frequent symptom was cough, dry at first and later becoming productive. Of our patients 88.6 per cent had foul sputum, 11.4 per cent had odorless sputum, and 57.8 per cent had hemoptysis. Chills and fever were found in 90 per cent of the cases and chest pain in 94 per cent.

5. In the cases reviewed 154 were male and 90 female, 208 adult and 36 children. The

average age of the adult patients was 35.9 years and the children ranged between 1 month and 13 years.

6. The average duration of the disease in these cases presented was 1 year. This factor is to be considered when the type of treatment to be prescribed is selected.

7. We consider the following as possible preventives of lung abscess following surgery: (a) good care of teeth, gums and throat before a contemplated operation; (b) avoidance of the use of strong sedatives before and after operation because they decrease the cough reflex; (c) frequent aspiration of the trachea and bronchial tree by nasal catheter; (d) the encouraging of the patient to cough after operation; (e) early aspiration bronchoscopy in a postoperative atelectasis.

8. In acute cases the abscess should have surgical drainage as soon as it is diagnosed.

9. In some chronic cases we try conservative treatment first and if the patient does not improve sufficiently with this treatment operation is performed.

10. We create surgical drainage by several methods depending on the location of the abscess. In cases of peripheral abscess with empyema a thoracostomy is performed with additional enlargement of the opening in the lung by cautery if necessary. We performed 37 thoracostomies for associated empyema. In cases with more deeply situated abscesses the cautery procedure described in the text was carried out, totally unroofing the cavity with resection of the overlying ribs. This procedure is performed in one or two stages depending on whether or not the pleura is adherent. When done in two stages an interval of from 10 days to 2 weeks is allowed to elapse between stages. In all surgical procedures we use general anesthesia. Needle aspiration is helpful in accurate localization of the abscess after the pleura is exposed. We allow the pack to remain in the abscess cavity for about 3 days, changing it the first time under general anesthesia. Thereafter the pack is changed every other day and applied more loosely to allow the lung to re-expand.

In some cases in which the cavity does not heal completely and bronchial fistulas remain over a considerable period of time we perform

a lobectomy. There are 3 lobectomies in this series and 1 total pneumonectomy.

11. The postoperative complications that we encountered were hemorrhage, spill-over empyema, septic spread of the disease involving the subcutaneous tissues of the body, kidney, spleen and brain. Bronchopleurocutaneous fistulas sometimes require plastic operation. Schede thoracoplasty or lobectomy for obliteration.

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VOLVULUS OF THE SIGMOID COLON

Report of Twenty five Cases

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IN the United States volvulus of the sigmoid colon is so uncommon that few series are large enough to evaluate adequately the clinical picture diagnosis and therapy of this condition. This is not true in Eastern Europe for of 215 cases of intestinal obstruction reported by Pearlman from a Russian clinic 111 or more than half were cases of volvulus. Of 10 cases seen at the Friedrichshain Hospital in Berlin Braun and Wortman list 31 cases of volvulus of the sigmoid colon. At the Cook County Hospital 438 cases of large bowel obstruction were treated between 1937 and 1945. Thirty seven of these cases were volvulus of the sigmoid colon at an incidence of 8.0 per cent. These cases comprised 2.2 per cent of all intestinal obstructions admitted. The clinical and surgical records and the x ray films in 25 of these cases of established volvulus of the sigmoid in which all the data were complete have been reviewed and constitute the basis of this report.

ANALYSIS OF CASES

Table I gives the age distribution of sex and symptoms in 25 cases of volvulus of the sigmoid colon. The following observations were made: 14 cases or 56 per cent were confined to the age group of 51 to 70 years. The sex is usually reported as predominately male and our series agrees showing an incidence of 16 males and 9 females. Although volvulus has been divided into 3 groups by Fernstrom our cases fit better into two general types: acute and subacute. Seven patients of the acute type or 28 per cent which occurred in the younger age groups had an onset that is short in duration usually about 4 hours with no history of previous attacks and an

equivocal history of constipation. All these patients experienced early emesis of a transient nature and generalized cramping abdominal pain. Eighteen patients of the subacute type or 72 per cent showed a different picture in that the condition occurred in the older age groups had a more gradual onset of symptoms with an average duration of 102 hours and consistently presented a history of previous attacks chronic constipation emesis late in the course of the disease and cramping lower abdominal pain.

In Table II the physical findings are summarized in both the acute and subacute types of volvulus. Half of the acute type showed distention audible peristalsis minimal abdominal tenderness and ability to take amounts of enema up to 1000 cubic centimeters. The x ray films in these patients indicated distention of the sigmoid due to volvulus and laparotomy revealed a sigmoid volvulus with viable bowel. The remainder of the acute type had severe distention absence of peristaltic sounds abdominal tenderness and the inability to take more than a 500 cubic centimeter enema. The flat film of the abdomen or the barium enema revealed a pattern indicative of volvulus of the sigmoid. Laparotomy confirmed these findings and showed in addition a gangrenous loop of bowel. The 2 deaths which occurred in the acute type had developed a gangrenous segment.

All the cases of the subacute type of sigmoid volvulus were characterized by severe abdominal distention. Marked tympany and audible or visible peristalsis were also absent. Abdominal tenderness was a variable finding. The enema test was for the most part consistent in that 76 per cent of the patients were unable to take more than a 500 cubic centimeter tap water enema introduced under the force of gravity. The patients who were able to take

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TABLE I—SYMPTOMS ACCORDING TO AGE DISTRIBUTION

Age groups	0-20		21-40		41-60	61-80	81-90	T
Number of cases								
Percentage of cases								
Sex—male								
Sex—female								
Onset	Acute	Acute	Acute	Barium	Barium Acute	Barium	Barium	Subacute
Age in days—hours			8				96	
Previous attack	0	0	1	1	1	1	1	
Emesis—1	1	1	1	0	0	1	0	
Emesis—2	0	0	0	1	1	1	1	
General abdominal pain—	1	1	1	1	1	1	1	
Low				1	1	1	1	
Constipation	0	1	1	1	1	1	1	

X—Present

O—Absent

more than 500 cubic centimeters were in the class of incomplete volvulus and the enema return was always incomplete as some of the solution was caught in the twisted loop. It was seldom necessary to use the barium enema to make the diagnosis. However in those few cases in which on examination of the gas pattern on the flat film of the abdomen doubt

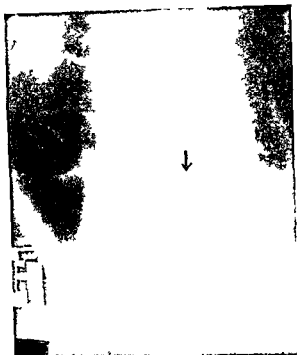
TABLE II—PHYSICAL FINDINGS IN TWENTY FIVE CASES OF VOLVULUS OF SIGMOID

	Acute volvulus mild case	Subacute volvulus moderate case	P
Diagnosis—mode			
—severe		8	
Typhoid	7	8	
Physical signs—visible			20
—audible	6		
—absent			
Abdominal tenderness—rebound			20
—rebound			20
—absent			
Enema—cubic centimeters			20
—500 less			
—500 more			21
—500 more			
Very erect—flat film			80
—barium enema			70
Gangrene			15
Viable bowel			

still existed as to the diagnosis the pattern of the barium enema was conclusive. Gangrene was present in half of the cases of the subacute type. The mortality rate was 50 per cent but was unrelated to the gangrene since an equal number succumbed with a viable bowel as with a gangrenous bowel. The overall mortality for both types was 40 per cent.

The acute type follows the course of a fulminating lesion and there is the same marked prostration that is associated with volvulus elsewhere in the gastrointestinal tract. Because all of these patients have early transient emesis, cramping abdominal pain with tenderness in all the quadrants of the abdomen and some fever, their symptoms may be mistaken for an inflammatory intra-abdominal lesion. The following case is cited as representative of this type.

A B 33 11 1 r d f m l perf tl
11 1 18 h rs pri t dm ha g l pt
w l l a d t h 1 br kf t Sh hal
m l b l m me t d w t t w k At 93
a m h w d th cr mp g b l m al
p a n m s n th l f t d Sh m t f
what h had eat Th mps th be m g
e l d l th gh th y w r les At 100
m h took m ff r ves t m l cat Th
p a n th becam q t re d th pat t w
take h m d p t t bed At 100 p m h leg
t m t cl a f th y m t u al th d d t et
od B 600 p m th p a h l be m p r res
l d th pat t l c i l t g t t e
ho-p tal



l g A t t f 8 h rs l t l t fil
t l th l t ded gm d l oc py g th ght
t l Th se l ry d t t fth l l th
A l l t t t th ght ppe l l
A k th pe t f l l

l hys l minat nr t l c l r d f n a l
h a p p e r l c u t l i l l T m p e t r a 996 J
g < j r t t 22 pul 88 b l l r
6 86 H r l t m n a l t l d 3 c t m t e
bo th x v j h j l l n Th g n l l
b l m l t n f l th b l t d nes
S m g l t y t ent L e r l l n
m h l l t f t i u n l w l m h d m a k
d l l w l t r u c t n t J h j a t t
a n l l t r t i n t a j t r a A t l m f
th l l m l l n n m g a i l l l b o t
g r e s t t g m l f l l (F g) A g
g l t f g m l t h 360 l g r t t
f l t t x a t n d w t r t l b t
z a t (M k l) j o c l Th t t m l a n
t f l r

In contra t to the acute fulminating type of l e n d c r i b e d t h e r e i s t h e m o r e c o m m o n l y s e e n t y p e o f s i g m o i d v o l v u l u s w h i c h w e h a v e c a l l e d s u b a c u t e . T h e g r e a t m a j o r i t y o f t h e s e p a t i e n t s w e r e a m b u l a n t t h r o u g h o u t t h e c o u r s e o f t h e d i s e a s e d e p i t e t h e t r e m e n d o u s d i t e n t i o n o f t h e i r a b d o m e n a n d a c o m p l a i n t o f o n l y m i d e r a t e l i - c o m f o r t . T h e s y m p t o m a r e a t t a c k s o f p a r t i a l o b s t r u c t i o n o f t h e c o l o n

F g k t h t l l D t
h t h d B h t
t d f f d e s l f t f t h g m l d t
d t l t t h t f t h t t t h f l t h e d y t t
t t t t h l j t o t h t t f t h

Obstipation for a day is followed by a distended abdomen and gas pains below the navel relieved by flatus. The tendency is for the attacks to become more frequent until complete obstruction end the patient to the physician (12). The following case illustrates the subacute type of sigmoid volvulus.

C D 53 l l c o l c l m a n s n
a m l u l t p t i t h a d m t t e i t t h h j t l
t h t h f l l g m p l i t S h s t t d t h a t 8
h t u l h e n t e l a c r m g g b i m n a l
p m o d a t n f r a n i l c a t e d u j a p u b c a l l y
t h l a b i m n S h t k o m e m i n e a l l f r
f f T h p a h n n e l t m t t l
f a l u t h u f t r t h t t p p e l a n h
l t t h p i n c u r r e d t h t m l c t l t h l f t
l r q l t T h s p a m c h t h m a
t l t t f t f t g i t n t r c u g b t
v o t 3 m n t a l l g h b o t m u t s
T h p a n t h n j l t h g h t t h e n t l
l l m n a n l b o t g h u r s f i r t h n t f t h
p a t h j t n t n e d t h t h b i m b e
g n g t l l 2 n t v f h u r s a f t t h n t
t h j a t n t h a f a b o l m m e n t p g l g
a m n t f f s l f t T h j t t t h



TABLE III—OPERATIVE RESULTS IN CASES OF VOLVULUS

Time of operation	Number of cases	Findings	Results
1 hr	8	All patients had long sigmoid loops	—100% survival —Cecostomy— Bilateral ectomy distal proctectomy —Cecostomy
1 hr		—Recurrent	—Necrotic —Recessed —Recessed —Serosal mucosa
Rankin obstruction		—Cecostomy— Proctectomy distal proctectomy	
Conservative	4		—Cecostomy— Hemicolectomy —Cecostomy— Proctectomy distal proctectomy —Hemicolectomy
Nonoperative			
Latent			—Cecostomy



Fig 5 Sigmoid colon with volvulus. 3 days after operation. The patient recovered and was discharged.

attempted to correlate the surgical procedure and its sequelae. In 11 patients were treated by a Mikulicz (11) procedure. Of these 6 were treated by this method as the initial procedure. One patient had a cecostomy 15 days previously and 1 patient had a simple detorsion then a recurrent attack and a lateral anastomosis and on the third recurrence an exteriorization and resection of the markedly redundant sigmoid loop. Three patients expired and in all 3 gangrenous bowel was present.

Six patients were treated by simple detorsion with 1 death. Of these 3 patients had recurrent attack 1 of which was relieved by conservative therapy 1 by a lateral anastomosis between the proximal and distal sigmoid loops. 1 patient was not relieved by conservative therapy and expired.

Five patients were treated by a Rankin procedure (14) with a fatal outcome in 3.

In 4 patients the diagnosis of large bowel obstruction was made and they were treated

by a McNeely cecostomy (10). They did not respond to this therapy. Two patients died and of the 2 who survived cecostomy one required a Rankin obstructive resection 24 hours later for gangrenous bowel and the other was partly relieved by the cecostomy only to become completely obstructed requiring an exteriorization procedure 15 days later.

Two patients were treated by conservative method of oil and enema routine in the knee chest position because they refused operation. One of these recovered but he had a recurrence of his volvulus 2 years later and expired.

One of the most significant findings in this review of the operative and nonoperative therapy of volvulus of the sigmoid colon is that volvulus is a lesion with a marked tendency to recur doing so in 20 per cent of the case and necessitating further operative procedures and being associated with a mortality of 40 per cent.



Fig 6 I distal cut set f h d t u
 Fl t h l n h th m a k e d d g f d t u f t h g
 m d l o p h h o c p e s t h u b d m l t y
 Ar m k t h p o t f t h l t s

DISCUSSION

Since volvulus takes place by rotation of the loop around its mesenteric axis it requires of course a mobile loop of sigmoid (9). Trues considers chronic constipation an important etiologic factor. All writers stress the increased length of the intestinal loop involved and many attach significance to a vegetable diet among the Russian and Siberian people. In our series there was no incidence of vegetable dietary abnormalities. Rather we found that there was a constant finding of chronic constipation and cathartic habit. These factors could produce hypertrophy of the sigmoid colon in length breadth and thickness while the mesenteric base remained the same. Such condition might predispose to volvulus. Brehm observed an abnormally long sigmoid flexure to be more frequent in male than in females. Another possible explanation of the difference in sex frequency offered by Wangensteen (8) is that the more relaxed abdominal wall and roomier pelvis in the female is more apt to

favor spontaneous rotation if a twist occurs. Other etiologic factors which we have observed at laparotomy include a kink in the colon either congenital or due to an appendectomy or due to previous attack of volvulus with hemorrhage into the mesentery and healing with scar formation causing a secondary contraction of the base of the mesentery (6).

Bloodood gave an interesting and reasonable explanation of the mechanism of volvulus. He believes that a distal colon distended habitually with feces will develop a thickening of its wall. This phenomenon can be verified in resected specimens. The sigmoid is found to be thickened up to 1 centimeter in spite of a tremendous amount of acute distention. The base of the mesentery in such case is relatively narrow and the condition is spoken of as a contracting mesenteritis. This contraction draws the base of the mesentery of the proximal and distal portions of the sigmoid to ether thus enabling it to be more easily twisted. Constipation and fermentation with the formation of gas and the consequent distention lifts the sigmoid loop up into the abdominal cavity and as the proximal sigmoid dilates it becomes more tense because of its fixed attachment with the descending colon. Meanwhile the lower portion of the sigmoid and the upper part of the rectum which are less fixed rise and as the least resistance is to the left the distended lower portion of the sigmoid and rectum move in that direction. The upper portion of the sigmoid moves down to the right and the volvulus is produced with a clockwise mesenteric twist. Such twist was found to be present in the 6 case of which a record of the direction of the volvulus was kept. But since in 19 other cases the direction was not noted the evidence is still inconclusive.

The greatest incidence of volvulus of the sigmoid colon occurs in middle and advanced years. In 119 cases collected in the European literature Giffhorn observed the following age distribution. Of 108 cases of volvulus of the sigmoid 46 cases were in the age group of 31 to 50 years and 40 cases were in the age group of 51 to 70 years.

Determination of the capacity of the colon by the use of a tap water enema has shown that

considered as a sign of diagnostic importance in mechanical obstruction of the large bowel. The normal capacity of the colon in an unobstructed adult is usually 2 to 3 liters of water. The inability to introduce 500 cubic centimeters of water points to the presence of sigmoid volvulus (17). This diagnostic finding was present in the majority of cases but when the volvulus of the sigmoid is incomplete 3 liters of water may be introduced into the redundant loop. However it has been our experience that when this occurs the patient can expel only a small portion of this amount. Since only 24 per cent of the patients showed this valve like action it cannot be regarded as a pathognomonic findings as has been claimed by some authors.

Tenesmus and bloody mucus in the rectum have been reported as not being infrequent but was present in only 1 of our cases.

Of great diagnostic significance is both the flat x ray film of the abdomen and that following the use of barium enema. We wish to call special attention to the rather typical gas pattern of sigmoid volvulus as is demonstrated in Figures 1, 2 and 7. In all these cases which vary in duration from 24 hours to 5 days it is quite evident that the tremendously dilated sigmoid loop is situated in the right side of the abdomen and there is moderate distention of the colon beyond it. These findings are classical roentgenographic evidence of sigmoid volvulus (8). Rigler and Lipchultz state that the diagnosis of sigmoid volvulus is made by the demonstration of a double point of obstruction, the size and position of the sigmoid loop and the presence of unusual amounts of fluid. From the evidence of the roentgenograms in our own series the presence of an unusual amount of fluid appears to be an atypical and coincidental finding. Even in these cases in which there was neglect in treatment for 4 and 5 days no x ray evidence of an abnormal amount of fluid within the bowel was found.

Figures 1 and 7 demonstrate that x ray film after a barium enema reveal a normal mucosal pattern in the sigmoid and rectum distal to the dilated loop. The upper end of the opacity however comes to a sharp point and produces the appearance of an air of



Fig 7 A t t f S h d t B m
m l th f p des ppe f th g
m d l d t m d t t th l ul N t th
ooh b ptt m t fth fill g d f tas d t d
by th rr w

spades (7). The only lesion that may simulate this picture is obstruction due to tumors but in these cases there is usually a ragged stenosis coexistent with the lesion. Thus from the examination of the flat x ray films of the abdomen and in doubtful cases of the films following a barium enema the diagnosis of sigmoid volvulus may be made with a reasonable degree of assurance.

Treatment of these patients on the general surgical service at this hospital has been associated with a mortality of 40 per cent. Perthes reports a mortality of 39 per cent and Pearlman reported a mortality of 46 per cent. Metheny in his study of the problem recommends the routine conservative use of enema to relieve the obstruction but admonishes that this should not be persisted in too long. The signs of detorsion are the passage of large amounts of feces and flatus but this detorsion gives no assurance that the volvulus will not recur. Simple untwisting of the volvulus by this method or by surgical intervention has

been found to be inadequate because the underlying pathological condition has not been affected. Attempts to perform a lateral anastomosis in the presence of an unprepared distended bowel have been admittedly quite unsuccessful even though these patients may be completely decompressed at the time of surgery by the routine use of two rectal tubes which are threaded up into the redundant sigmoid and attached to a suction apparatus. Our data indicate that an exteriorization procedure executed in the presence of a viable bowel gives the best recovery rate. If a gangrenous bowel is present, resection is obligatory, but even in the cases of viable bowel secondary resection following the exteriorization procedure seemed to be the operation of choice.

SUMMARY AND CONCLUSION

1. There are two main types of sigmoid volvulus.

Acute (7 cases) characterized by occurrence in the younger age groups, short onset, equivocal history of constipation, early transient emesis, generalized cramping abdominal pains, abdominal tenderness, acute distention and marked prostration. These patients tend to develop gangrene early and run a fulminant course.

Subacute (18 cases) characterized by occurrence in the older age groups, of a more gradual onset of symptoms, history of previous attacks and constipation and emesis late in the course of the disease. These patients tend to develop gangrene slowly and run a more moderate course.

Seventy-six per cent of the patients were unable to take an enema of more than 500 cubic centimeters.

3. The single most helpful aid was x-ray examination. The typical roentgenographic findings are tremendously dilated sigmoid loop situated in the right abdomen, moderate distention of the colon above the volvulus, absence of a collection of fluid within the bowel, absence of pades appearance of the barium enema opacity, normal mucosal pattern in the sigmoid and rectum distal to the dilated loop.

4. Volvulus of the sigmoid tends to recur and therefore simple detorsion is not the treatment of choice.

5. Exteriorization and second stage resection give the best results.

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THE SIGNIFICANCE OF TUMOR CELLS IN SEROUS EFFUSIONS

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THE study of the physical, chemical, bacteriological and cytological characteristics of fluids obtained from body cavities has long been recognized as a valuable diagnostic procedure. Many times clinicians ignore another diagnostic examination which may be carried out on aspirated fluids. This is the study of sediments from fluids for malignant cells. The results of examining effusions in the following reported cases emphasize the importance of this procedure as a diagnostic aid and prognostic guide.

The identification of neoplastic cells in exudates has been attempted for many years. Zemansky cited Beale as the first to recognize carcinoma cells in exudates. Beale in 1860 found malignant cells in sputum from a case of carcinoma of the pharynx. In 1875 Quincke published the first study on cells in smears made from peritoneal and pleural fluids. From that time on the literature has contained reports of numerous series of cases in which stained smears were examined for tumor cells. Zemansky has published an excellent review of this work, and the reader is referred to his article for a review of this literature.

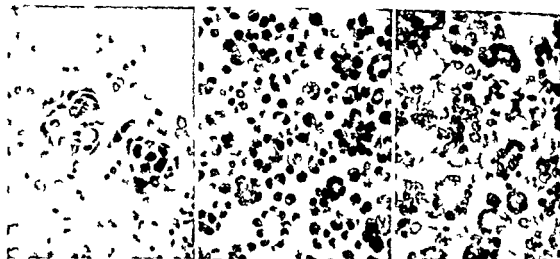
The earlier reports were based on smears made directly from the body fluids. Bahrenburg in 1895 was the first to use sections of sediment remaining after decantation of supernatant fluid. Mandelbaum described a simple technique of using sediment after centrifuging the original fluid. Several modifications of this method have since been developed. The advantages of sectioned sediment are that the cells may be studied in a natural relationship one to another and that the chance of finding small groups of epithelial

cells in tissue sections is greater than in study of direct smears. The appearance of cell groups is important since identification of carcinoma from individual neoplastic cells is most difficult. A large amount of fluid should always be used if available. There are occasions when only a few cells or groups of cells are present and the more fluid used the greater is the chance of observing them. However, typical carcinoma cells may be found in only a few cubic centimeters of fluid.

The technique used in making the histological preparations presented here is simple and follows the method of Mandelbaum. The fluid is allowed to settle by gravity by standing overnight in the icebox. The clear upper layer is poured off and the cloudy sediment is centrifuged at 3000 revolutions per minute in a wide tube measuring 3 by 7 centimeters for a 20 minute period. The supernatant fluid is decanted and 10 per cent formaldehyde added to the sediment. This mixture is allowed to stand for 18 to 24 hours when the formaldehyde is poured off. By this time the sediment has hardened and the resultant button can be gently removed with a small scalpel. An effort is made to remove the sediment in as nearly one piece as possible. It is then run through acetone, alcohol and chloroform paraffin embedded in paraffin, sectioned and stained with hematoxylin and eosin.

Examination of the smears. There are varied views as to the criteria on which a diagnosis of malignant growth can be made. Some investigators base a diagnosis of carcinoma on the appearance of individual cells. Emphasis is placed on such characteristics as the presence of mitotic figures, variations in the nuclei and the presence or absence of vacuoles. Foot and Quensel have stated that the diameters of the nucleolus and the nucleus are important and that the nucleolus to nucleus ratio is high in malignant cells. Zemansky reported that the presence of mitotic figures is pathognomonic

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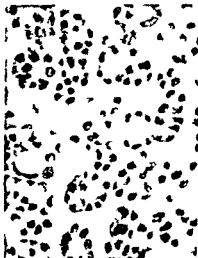
F S t f d m t f l t l f d
f the t g m d $\times 3$
F 2 S t f d m t f m p e d l f d

f f t h b t $\times 3$ 5
f g 3 S t f d m t f t h f d c r
f t h l $\times 3$

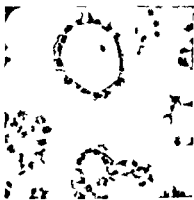
of carcinoma. However Karp and Foot have shown mitotic figures in mesothelial cell. Zeman's criteria for the recognition of tumor cells are the finding of fragments of tissue with definite arrangement of the cells in acinar or papillary formation, the presence of multiple groups of large deeply staining cells, and the finding of fine cellular changes such as eccentric nuclei or mitotic figures. Foot found

acini or papillae in 15 per cent of his cases, metaplasia in 43.5 per cent, mitosis in 26 per cent, and multinucleation in 65 per cent. The diagnosis of neoplasm may be confused by the presence of mesothelial, pleural, pericardial, and peritoneal covering cells. Schlesinger in a study of fluid taken from 100 patients made a diagnosis of carcinoma only after finding groups of cells whose arrangement left no doubt as to their epithelial nature.

In the cases here reported the diagnosis of carcinoma was based primarily on the findings of tumor cells arranged in pseudopapillary



F 4 S e t f e d m t f m p e t l f d p p l
l r v d o c a t i s $\times 3$



F m S e t f e d m t f m p e t l f d
f t h r v a x $\times 3$

settes or papillae. In a few cases cells were found in cord or in solid groups and the variation in size shape and chromaticity was such that the diagnosis of malignant neoplasm could be made without reservation. Several illustrative cases with accompanying photomicrographs are presented.

CASE 1. A 67 year old white male physician was admitted to the University Hospital because of ankle edema abdominal swelling and pain in the right arm. A paracentesis had been performed the day before admission and the paracentesis diagnosis was portal cirrhosis. On the day of admission the patient suffered a spontaneous fracture of the right humerus. Examination on admission revealed marked pitting edema of the lower extremities dyspnea abdominal swelling crepitation around the right upper arm and evidence of pleural effusion. Carcinoma was then suspected and confirmed by finding tumor cells in sections of sediment from the abdominal fluid. The patient died a few days after admission. Postmortem examination was permitted and an adenocarcinoma of the rectosigmoid was found with metastases to the peritoneum and pleurae.

The section (Fig. 1) shows two groups of cells. These cells are arranged in irregular solid groups. The cells vary in size shape and chromaticity. Although the section represented does not show mitoses too clearly, other sections presented numerous mitotic figures.

CASE 2. A 42 year old white female was admitted because of recurrent attacks of upper abdominal pain nausea and vomiting of 6 weeks duration. The patient had a radical mastectomy for adenocarcinoma of the breast $2\frac{1}{2}$ years before admission. A distended abdomen moderate dyspnea and slight cardiac enlargement were found on examination. A few days after admission the patient developed a paracentesis and then signs of massive pleural effusion. A pericardial tap was done and 250 cubic centimeters of blood fluid removed. Shortly afterward the patient died and permission for autopsy was not granted. The diagnosis from tentative cancer was made in the examination of sediment from the pericardial fluid.

The section (Fig. 2) shows numerous red blood cells lymphocytes monocytes and isolated mesothelial cells. There are present many clumps of atypical epithelial cells arranged in pseudocords and rosettes. The cells vary in size shape and chromaticity and occasional mitotic figures can be seen. The cells are irregularly placed in the acinar group.

CASE 3. A 66 year old female entered the University Hospital because of loss of weight anorexia and constipation of some months duration. A gastrointestinal series made in the hospital demonstrated a possible perilecine. Examination

revealed a tender mass in the left lower abdomen and evidence of fluid in the right pleural cavity. A thoracentesis was performed and malignant cells were found in the fluid. The patient was discharged with the diagnosis of inoperable carcinoma of the colon.

The section represented in Figure 3 presents numerous large pyknotic epithelial cells arranged in acini and rosettes. The acinar formations vary considerably in size. The epithelial cells are inconstant in size shape chromaticity and are irregularly placed in the acinar groups. These sections are compatible with carcinoma of the colon.

CASE 4. A 55 year old white female was admitted because of dyspnea ascites nausea vomiting and loss of weight. These symptoms appeared after the patient had been discharged from the hospital 2 months previously. The discharge diagnosis was lymphogranuloma ascites and pleural effusion the latter of undetermined etiology. An abdominal paracentesis had been performed but the fluid was not examined for cells. Eight years before the initial admission the patient had undergone a bilateral salpingo-oophorectomy and hysterectomy. This as done in another hospital and the reports on the surgical specimens could not be obtained. At the time of the latest admission dyspnea abdominal distention marked pitting edema of the lower extremities and bilateral pleural effusion were found. An abdominal paracentesis and a thoracentesis were performed and adenocarcinoma was found on the examination of both fluids. The patient expired after a rapid downhill course. At autopsy a rectal stricture with granuloma and papillary adenocarcinomatosis with pleural and peritoneal metastases were found. The site of the original malignant lesion was not satisfactorily determined.

The section shown in Figure 4 represents a section from the peritoneal fluid. Irregular cells with hyperchromatic nuclei of various sizes arranged in pseudoacini and papillae are seen. This arrangement was also found in samples of pleural fluid and in a biopsy specimen of a nodule which appeared on the abdominal wall following the paracentesis. Probably if the abdominal fluid had been examined at the time of previous admission the diagnosis could have been made then.

CASE 5. A 41 year old white female was first admitted to University Hospital because of irregular vaginal bleeding. Pelvic examination had disclosed erosions of the cervix and several biopsy specimens taken on the outside had been reported as benign. Another biopsy specimen taken in the hospital had been reported as squamous carcinoma. The patient was given radium therapy and discharged. A week later she was readmitted because of abdominal swelling. At this time a small mass was palpated in the region of the left ovary. A paracentesis was performed and a diagnosis of papillary adenocarcinoma was made from sections of the sediment. The patient was considered inoperable and died a few weeks later. Autopsy was not permitted.

TABLE I —INCIDENCE OF MALIGNANT CELLS IN PUNCTURE FLUIDS

Clinical diagnosis	No. of cases	Type of fluid examined in cases			Cases with malignant cells in fluid	Cases in which malignant cells were found	Percentage of cases in which malignant cells were found	Confirmatory		Percentage of confirmed cases with malignant cells
		Pleural	Pericardial	Peritoneal				Cases confirmed	Cases unconfirmed	
Carcinoma of breast					8		7			77
Carcinoma of lung	8				6				6	
Lymphoblastoma	7				3					60
Hypothymoma										
Carcinoma of esophagus	3						00			00
Carcinoma of stomach							00			00
Carcinoma of duodenum							00			00
Carcinoma of pancreas							00			00
Carcinoma of bladder							00			00
Carcinoma of gallbladder							00			00
Carcinoma of stomach		4	5		6		66.3	8		
Carcinoma of liver	6		6				6.6			
Carcinoma of cervix										
Carcinoma of uterus										00
Carcinoma of ovary		3			8		3			66
Total		8	3					6		

TABLE II —INCIDENCE OF MALIGNANT CELLS IN PUNCTURE FLUIDS

Clinical diagnosis	No. of cases	Type of fluid examined in cases			Cases with malignant cells in fluid	Cases in which malignant cells were found	Percentage of cases in which malignant cells were found	Confirmatory		Percentage of confirmed cases with malignant cells
		Pleural	Pericardial	Peritoneal				Cases confirmed	Cases unconfirmed	
Pulmonary tuberculosis		6							3	
Lung abscess										
Tuberculous peritonitis										
Pulmonary infarction										
Atypical pneumonia										
Pulmonary embolism									5	
Cancer of lung										
Unknown origin						3			3	
Total				29						

The material presented in Figure 5 shows that the percentage of malignant cells found in the fluids examined was 14.3. The percentage of malignant cells found in the fluids examined was 14.3. The percentage of malignant cells found in the fluids examined was 14.3.

SUMMARY OF RESULTS

From 1934 to 1944 17 samples of fluid aspirated from 14 patients have been examined for malignant cells. The technique and the diagnostic criteria discussed were used

in all cases. Carcinoma was suspected in all of the 14 patients at the time the fluids were examined and the study of the sediments was regarded as a means of establishing or confirming the diagnosis. In 5 of the 14 cases the diagnosis at death or discharge was not carcinoma. The negative diagnosis was confirmed in 40 cases by autopsy or exploratory laparotomy. In 91 patients carcinoma of some form was the final diagnosis at death or discharge.

TABLE II—RESULTS OF EXAMINATION OF SEROSAL SURFACES

Clinical diagnosis	Confirmed cases	Cases serosal as wh h l m ed	Cases serosal we h h impl fou d	Cases h h impl f	Cases wh h l m found	Cases wh h l m d
Carcinoma of the breast						
Carcinoma of the lung		8	3	5	3	5
Carcinoma of the stomach						
Hepatic carcinoma						
Carcinoma of the rectum	3	3	3		3	
Carcinoma of the testis						
Carcinoma of the ovary						
Carcinoma of the pancreas						
Carcinoma of the bladder						
Carcinoma of the gallbladder						
Carcinoma of the thyroid	8	4				
Carcinoma of the prostate	6	6				5
Carcinoma of the skin						
Carcinoma of the cervix						
Carcinoma of the uterus						
Carcinoma of the vagina			8	3	7	4
Cases of unknown origin		43	26			

Reference to Table Ia will show that in the 91 cases of suspected carcinoma examination of the sediment from fluids revealed malignant cells in 41 or 45 per cent of the cases. The fluids included pericardial 1, peritoneal 32 and pleural fluids 58. The highest proportional incidence of tumor cells in aspirated fluid was found in the cases of carcinoma of the gastrointestinal tract where cells were reported in 11 of 15 cases. Tumor cells were found in 8 of 11 cases of carcinoma of the breast. Although carcinoma of the ovary inclines toward peritoneal implantation, in only 53.3 per cent of the cases did the fluid contain neoplastic cells. Only 21.4 per cent of the cases of primary pulmonary carcinoma and 16.6 per cent of the cases of primary carcinoma of the liver were reported as positive. The 1 pericardial specimen contained neoplastic cells while 43.1 per cent of the pleural fluids and 47 per cent of the peritoneal fluids revealed tumor cells.

Confirmatory evidence of the diagnosis of carcinoma was obtained either by roentgen examination, operation, biopsy or autopsy in 67 of the 91 cases. Autopsy was performed in 25 cases, confirmatory biopsy or operation was obtained in 9 cases and appropriate roentgen examinations confirmed the diagnosis in 10

cases. The incidence of positive fluids in the group of confirmed cases of carcinoma was 58.2 per cent or 39 of 67 cases. All but 2 of the cases in which malignant cells were found in the fluids were included in this proved group. In all cases with a positive report of neoplastic cells, diagnosis of carcinoma was confirmed clinically. In none of the 51 cases in which carcinoma was suspected but diagnosis other than carcinoma was eventually made were malignant cells wrongly reported.

To obtain a more correct evaluation of pathologic examinations of puncture fluids, an effort was made to collect a group of cases of confirmed carcinoma in which direct search for serosal implants had been made. Forty-four such cases were found in 28 autopsies were performed and in 16 cases examination of the serosal surface was made possible by operative means. Table II presents the observations in these cases. In 26 of the 44 cases definite serosal implants were found. Of these 26 cases, 22 or 84.6 per cent of the fluids contained neoplastic cells. In only 1 case in which a positive report was returned on the fluid were serosal implants not found. The fact is that in those cases of carcinoma with effusions which contained tumor cells, 93 per cent were proved to have serosal implants.

TABLE III—RESULTS OF REPEAT EXAMINATIONS

Location of cavity	Type of fluid examined	Repeat examinations					Confirmatory tests
			1st	2d	3d	4th	
Chest	Pleural	+	4 days	+			Negative
Lung	Pleural	+	4 days				Aspirate
Lung	Pleural	-	7 days	-			Confirmed
Lung	Pleural	-	1 week	+	1 week	-	Brother's biopsy
Testis	Pleural	+	4 days	+			Operative
Liver	Pleural	+	1 week	+			Aspirate
Lymph nodes	Pleural	-	1 week	-			Negative
Rectum	Pleural peritoneal	+	3 weeks	+			Aspirate
Lung	Pleural	-	1 week	-			Negative
Stomach	Pleural	-	1 week	+			Negative
Chest	Pleural	+	1 day	-			Biopsy
Stomach	Pleural peritoneal	+	3 weeks	+			Negative
Stomach	Pleural	-	1 week	+			X-ray
Rectum	Peritoneal	-	3 days	+	1 week	-	Aspirate

In 41 of the 14 patients fluids aspirated on two or more occasions were examined. This procedure was carried out because the results of the first examination did not agree with the clinical diagnosis or because the diagnosis was still uncertain. In 7 of these 41 cases the final diagnosis was not carcinoma. Table III shows the results of re-examinations of fluids from the 14 cases of carcinoma. In 5 cases neoplastic cells were found in both original and repeat examinations. In 2 cases in which a positive report was obtained in the first examination repeat reports were negative. Of the 7 cases in which no cells were found in the original studies in 4 instances malignant cells proved to be present at subsequent observations. These results indicate that repeat examinations of puncture fluids are warranted and are sometimes essential to correct diagnosis. When carcinoma is suspected clinically a negative original report is not conclusive and more fluid should be examined if possible.

COMMENT

Clinicians are sometimes disappointed when the pathologist fails to find carcinoma cells in fluids obtained from patients in whom the diagnosis of carcinoma has been confirmed by roentgen or operative examinations. This is

especially true in primary carcinoma of the lungs in which a low percentage of positive fluids was reported. From the observations in Table II this low incidence can be explained. Of 8 cases of pulmonary carcinoma in which studies of the pleurae were possible only 3 were found to have pleural implants and in all of these 3 cases the pleural fluids contained malignant cells. The effusions in cases of primary carcinoma of the lung are largely due to venous obstruction with transudation or to pleural irritation and exudation caused by inflammatory reactions secondary to primary growth in the lung. Pleural implants occur in less than one third of the cases.

Many times abdominal and pelvic surgery is attempted even in the face of positive pathologic reports on abdominal fluid in the hope that no peritoneal implantation has taken place. The results which have been discussed shatter this hope and the finding of cells indicates that serosal implantation has probably occurred and surgery is of only palliative value. The prognosis is extremely poor in those patients in whom neoplastic cells are reported in puncture fluids.

SUMMARY AND CONCLUSIONS

In these cases of suspected carcinoma with effusion the diagnosis of carcinoma was est-

established or confirmed by examination of the sediment in 45 per cent of the cases

Malignant cells were found in nearly 60 per cent of fluids from cases of confirmed carcinoma

A positive report of malignant cells is indicative of carcinoma but a negative report is not conclusive

When malignant cells are found in effusion fluids chances of having serosal implants are great (95%) prognosis poor and operation is inadvisable except as a palliative measure

Effusions in those cases of confirmed carcinoma in which no cells are found may be due to venous obstruction and pressure effects

A definite diagnosis of carcinoma should be based on sections containing groups of cells

arranged in definite acinar or papillary formation

Repeat examinations are essential when the diagnosis is still uncertain

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EXPERIMENTAL STUDIES IN PERIPHERAL NERVE SURGERY

IV The Effect of Infection on Regeneration and Functional Recovery

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IN a previous article¹ we presented a study of the healing of gunshot wounds involving peripheral nerves and were able to show that the majority of the wounds which were not chemotherapeutically treated became grossly infected. However the extensive changes produced within the nerve and the delayed recovery of function were to a large extent the result of the nature of the injury and not directly related to infection. In order to study the direct effect of infection on nerve repair and regeneration the sciatic nerve of 79 animals was sectioned and repaired under septic conditions. None of the ordinary aseptic precautions were observed the shaven skin was not cleansed and the operation was performed with unwashed hands and unsterile instruments silk sutures gauze and cotton sponges and skin clip. Some of the wounds became grossly infected and developed abscesses and phlegmons the resulting septicaemia ended in the death of 15 animals. The wounds of the other animals were all contaminated even though no abscess formed. Bacterial cultures taken at the end of the operations showed a definite growth of Staphylococcus albi and Bacilli protei. Cultures of the purulent material of the infected wounds revealed a predominating amount of nonhemolytic streptococci Staphylococcus albi Bacilli protei and spore forming gram positive aerobic rods.

The sectioned nerve was repaired by end to-end suture in 16 animals by the transplantation of contaminated autogenous grafts in 32 animals and of contaminated homogenous grafts in 31 animal. The infection which developed in these contaminated

wound formed abscesses 4 to 5 days after nerve repair. When the abscesses were not drained the animals died 7 to 14 days later. No animals died of sepsis in the group of contaminated end-to-end sutures. Following transplantation of contaminated autogenous grafts 4 of 32 animals died of sepsis and 11 of 31 contaminated homogenous grafts died of sepsis. No death occurred in either of the latter groups when sulfonamides were used locally in the wound at the time of nerve repair.

In most instances the nerves were found intact the sutures were holding and the grafts were intact as they crossed the abscess cavities. Skin subcutaneous tissue and muscle underwent partial liquefaction and necrosis long before the nerve became involved. However these nerves were sutured before the infection became active the site of nerve repair was practically healed when the abscess formed and it became necessary to perform a more critical experiment to study the reaction of a nerve suture in a previously grossly infected field. In 12 animal the bed of the exposed sciatic nerve was infected with purulent material obtained from the abscess of another animal and the nerve was then sectioned. Two days later the abscess which had developed was drained the wound debrided the nerve end trimmed end-to-end suture performed and the wound closed. Six of these animals died of the result of the sepsis before the nerve could be sutured that is within 2 days after implantation of the purulent material. In the other 6 animals the nerve was satisfactorily sutured. Of these 3 specimens were removed after 14 days and the other 3 were allowed to recover for several months. At the time of removal of these nerves a large amount of adhesions was encountered which immobilized the nerve at the site of the suture.

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When these adhesions were dissected away the nerve was found intact and resembled any other nerve repaired by primary end-to-end suture. Cultures taken from these virulent abscesses showed a heavy growth of non-hemolytic streptococci, Staphylococci albi and Bacilli protei.

The gross appearance of the nerve and the suture lines was about the same 30, 45, 60 and 75 days after repair in end-to-end sutures, autogenous and homogenous grafts. It corresponded to the description given in a previous article¹ of the aseptic series. However, the adhesions between the suture lines, the grafts and the surrounding tissues were slightly more extensive and denser and the suture lines were more prominent. The grafts appeared to be thicker at the time of removal than at the time of transplantation and were slightly more voluminous than in the aseptic series and this was especially noticeable in the homogenous grafts (Figs. 1, 2, 3).

Microscopic studies showed, depending on the age of the specimen, the same characteristics of degeneration and regeneration as previously described for the aseptically repaired nerves. The regeneration of nerve fibers, the formation of axis cylinders, myelinization and organization of the myelin decomposition products showed no appreciable differences from those findings in the aseptic group. However, in most of the septic animals a very strong epineurial cellular and fibrous reaction was present after 30 and 45 days and persisted for 60 and even 75 days. This reaction produced the appearance of a chronic perineuritis and small lymphocytic foci were often encountered around the silk sutures and within the epineurium and interfascicular perineurium. In the end-to-end suture group this epineurial reaction extended 1 to 2 centimeters proximal and distal from the suture line and was accompanied by a marked epineural proliferation. In the autogenous grafts neurotization was equally as good in the septic as in the aseptic grafts provided no severe infection took place. Lymphocytic foci were found in the suture lines, the epineurium and the interfascicular perineurium but no signs of inflammation or infection were present

within the nerve fascicles. The chronic perineuritis did not interfere with nerve regeneration. The strong mesodermal reaction which took place in the epineurium produced diffuse adhesions between the epineurium and the surrounding muscles. In the presence of a severe infection a complete necrosis of the graft occasionally took place and sometimes a necrosis of the axis cylinders of the central nerve segment was also observed. Following necrosis of the ectodermal and the mesodermal tissues the original graft structure was replaced by a neuromatous type of tissue so that the organization and the later neurotization of the graft were essentially heteromorphous in type. Thus severe infection complicated the internal graft structure and interfered to a certain degree with the outgrowth of the regenerating nerve fibers. These however ultimately reached the distal suture line and the distal nerve segment where they followed their normal isomorphous course to their end organs. Although the histological structure of aseptically transplanted homogenous grafts was predominantly heteromorphous, this type of organization and neurotization was still more accentuated in the septic grafts. Severe infections increased the degree of necrosis of the graft and led to a more pronounced heteromorphous organization. Chronic lymphocytic foci were frequently found throughout the proliferated epineurium and perineurium even 150 days after the operation and in some cases lymphocytic infiltrates were also present around the capillaries within the nerve fascicles. However, these chronic inflammatory processes did not interfere with neurotization.

The reaction of the nerve suture line and the graft to infection was more clearly seen in the nerves which were repaired after an abscess had already formed or which crossed an abscess cavity. It was interesting to study the reaction of the nerve severed within the abscess before it was sutured. Two days after section the nerve fascicles of the distal and proximal stumps were surrounded by infected perineurium and epineurium which contained numerous abscesses and were in a state of lively mesodermal proliferation. No attempt at nerve regeneration had yet taken place in

the proximal segment. The infected granulation tissue which had proliferated completely sealed off the open endoneural tubes of the proximal and the distal nerve segments and no evidence of infection or inflammation was present within the nerve fascicles. Regeneration will thus be greatly delayed and impaired.

Fourteen days after suture in the infected field purulent infected and hyperemic mesodermal tissue surrounded the epineurium which contained scattered small hemorrhages. Some suture abscesses were present but no inflammatory foci were seen within the nerve fascicles where regeneration had already taken place. The same picture was present 21 days after suture. Autogenous grafts removed from an abscess cavity 7 and 14 days after transplantation showed the same inflammatory epineural and perineural reactions to infection but no such changes had taken place within the nerve fascicles. Homogenous grafts removed from abscess cavities 6, 9, 17 and 21 days after transplantation were completely necrotic. Suture abscesses were present. Lymphocytic and leucocytic infiltrations, hemorrhages and histiocytic proliferation had taken place in the epineurium and the perineurium. Considerable hyperemia accompanied by perivascular lymphocytic infiltrations and hemorrhages were also present within the nerve fascicles. It was interesting to note that the living nerve in the proximal and distal nerve segments was protected against inflammatory processes whereas the necrotic homogenous graft took part in the infection in spite of the mesodermal reaction. Thus the effect of severe infection was worse in homogenous than in autogenous grafts. Living nerve tissue is protected from infection by its epineurium and perineurium which proliferate and keep the infection from entering the nerve fascicles.

FUNCTIONAL RECOVERY

End to end sutures. There were no differences in the sequence and the rate of recovery between the septic and the aseptic groups of animals. Motor recovery as tested by stance gait and voluntary motion of the leg muscles appeared around the 45th day after suture and motion in the dorsiflexors of the toes was seen

in only one animal of each group after 60 days. Obvious muscular contractures were found in one septic animal which lived 618 days and in which all movements could be elicited. Muscle atrophy was present in all animals; its degree varied widely but there were no differences between the septic and the aseptic groups. It was most marked 30 days after suture and diminished as recovery progressed. Some signs of sensory recovery to pain and deep pressure in the foot were present in the septic as well as in the aseptic animals after 60 days. A heel ulcer was present in one of the septic animals 45 days after suture. A reflex fanning of the 5th toe was obtained in one septic animal after 60 days. Direct electrical stimulation of the nerve above and below the suture line with an alternating 60 cycle current produced a plantar flexion of the foot in all animals after 45 days and a plantar flexion of the foot and toes and dorsal flexion of the foot in all the animals after 60 days. There were no differences in response between the septic and the aseptic groups.

One aseptic and two septic animals were allowed to recover for 2 years. One of them in which the sciatic nerve was sutured within the field of an abscess showed complete motor, sensory and trophic recovery after 8 months while the other two still had a marked weakness of the dorsiflexors and the adductors of the toes when sacrificed.

Autogenous grafts. There were no significant differences in the sequence and the rate of functional recovery between the septic and the aseptic groups of animals. In all the animals of this group as well as in those with homogenous grafts the distal suture line was resected and resutured 45, 60 and 75 days after transplantation of the graft. It was found that in the relatively short grafts used in these experiments the resection of the distal suture line of the graft did not delay or facilitate the return of function as will be shown in a later article. For this reason when reference is made to 90, 100 or 50 day old grafts the signs of recovery were tested 45, 60 and 75 days after secondary suture of the distal suture line.

Gait and stance began to recover with a lifting of the heel 90 days after transplanta-



Fig 1 Fig 2 Fig 3
 bo t th t l t 45 d ys ft pe t h g d l t dhes
 Fig 1 S pt t g gr ft 60 d y ft t p l a t t Th dh
 p ese t d th g ft l th d t l t l
 Fig 3 Sept h g ft 6 d y ft t p l t t h g l g
 Th dh t f d l t g h dh d th t g ft d both t l g d
 e d f f i c u l t d e c t a y l b o t h t r l

tion of the graft and after 120 days some animal stepped on the plantar surface of the toes while others still continued to step on the dorsal surface of the toes when walking. Recovery of toe drop was however more marked after 130 days. Obvious muscular contractions were seen in 3 animals with autogenous grafts 2 of them after septic operation. One was present 133 days and the other 163 days after transplantation they involved in both instances the extensor digitorum longus. One of them had a large persistent trophic ulcer of the heel which was present 60 days after transplantation. Heel ulcers were present in the 4 septic and 1 aseptic autogenous grafts and 3 of them occurred after secondary resection and resuture of the distal suture line of the graft. Muscle atrophy was present in all animals varying widely in range and diminishing in the older grafts. There were no differences between the septic and aseptic group.

Beginning sensory recovery was found on the lateral aspect of the foot in septic as well

as in aseptic animals 120 days after transplantation of the graft. This applies also to response to pressure of the toe pads. No fanning or step reflexes could be elicited in this group of animals even 163 days after grafting of the nerve.

Direct electrical stimulation of the nerve above on and below the graft produced plantar flexion of the foot in 80 per cent, dorsiflexion of the foot in 100 per cent, and plantar flexion of the toes in 40 per cent of the animals 90 days after transplantation of the graft. After 120 days plantar flexion of the foot and toes was present in 100 per cent, dorsiflexion of the foot in 50 per cent, and fanning of the toes in 25 per cent of the animals, and after 130 days plantar flexion of the foot was present in 80 per cent, plantar flexion of the toes in 40 per cent, dorsiflexion of the foot in 80 per cent, dorsiflexion of the toes in 60 per cent, and fanning of the toes in 20 per cent of the septic animal. The average score of the total response to electrical stimulation was about the same in septic as in aseptic ani-



F 4 S d d f th t l m t f th
t d y ft se t thu b ty
D g t d r p t sh f t d
beg ll l f t Th t d lt bes d
led ff by p lf t d f t d sod m lt hu h
g f th pe t th g p t bet
th t l d d t l e d Th nf t did t
pe t t t th f c l (Bod f h ta
X oo)

mals after 90 days 44 per cent for the septic and 45 per cent for the aseptic after 10 days 55 per cent and 57 per cent and after 150 days 56 per cent and 64 per cent respectively

Homogenous grafts More differences between the aseptic and the septic series were present in this group of animals than in the autogenous grafts and the end to end sutures

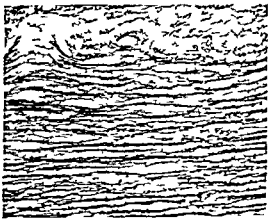


F R t g r v f t r s c g th t l
4 d y ft t g ly f ct d f l d Th y f ll
th p th f tgr g t b l l t d ll fibers
A t bsc ss p t b l th th k d pe
r n t th bott f th ph t j h (Bod
f h ta X 300)

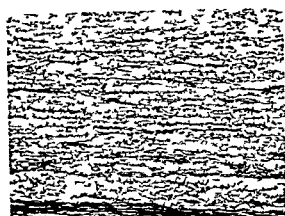
This may be due to the more extensive necrosis and greater vulnerability of the homogenous graft in the presence of infection and the resulting more complicated pattern of organization and regeneration. No recovery in stance and gait were observed in the first 75 days after transplantation of the graft. Lift in^g of the heel when standing began to recover after 90 days. After 120 days only 25 per cent of the animals showed some recovery a



F 6 C ss sect f nf ted r v 4 d ys aft
t h fsc l lscs th th p d d by t pe
ta t m Th r v fsc l t d t bed by th p es-
ce f th d nfect (Bodian f chs tain
X)



F Sept t gr ft 4 j ys ft t pl
ta h t l t bts d
l m t f my l d mpo t p od t bet re
them Th m ked p lf t f th pe m
b t on f f th th fsc l (Bod
f chs tain X)

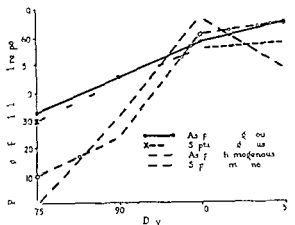


1 g 8 Sept h mog g ft m 1 f m b-
sc ty d ys ft t pl tat Th
f sc l filled th y l dec mpo t p od t
h h g l pe sc l lyn hocy t (lt t
A od t Th l be f g t g rv fbers lso
f se t Th l l yper t l th t
f se cul pe d fect d ta m
h h g d foc f ly ph cyt (Bod f h
ta X 9)

compared to 80 per cent in the aseptic series and after 150 days the heel drop was recovering in 50 per cent of the septic and 100 per cent of the aseptic animals. Toe drop or walking on the dorsal surface of the toes was present in all animals after 150 days.

Infection had no influence on the development of muscular contractures. Of the 6 cases with obvious contractures 2 belonged to the septic and 4 to the aseptic series. They were present 120 days after transplantation of the graft and involved mostly the extensor digitorum longus. Infection had no influence on the development of heel ulcers; neither was the formation of heel ulcers associated with muscular contractures or an increased amount of adhesions around the nerve. Heel ulcers occurred in 3 of 17 animals examined. Muscle atrophy was present in all animals and there was no difference between the septic and aseptic groups. After 90 days the gastrocnemius oleus muscle group had lost 70 per cent to 80 per cent of its weight; after 10 days this loss of weight varied between 50 per cent and 62 per cent and after 150 days it decreased to about 40 per cent.

Critical recovery of pin sensation was found after 150 days in either the septic or aseptic group. In 2 year old experiments complete return of sensation was found in



both groups. Step reflex of the foot and fanning reflex of the toes were late signs of recovery. They were not seen in homogenous grafts after 150 days but were present 2 years after implantation of the graft in both groups.

There was no response to direct electrical stimulation of the nerve or the graft during the first 75 days after transplantation. After 90 days plantar flexion of the foot was obtained in 75 per cent dorsiflexion of the foot in 25 per cent and plantar flexion of the toes in 50 per cent of the septic animals. After 10 days plantar flexion of the foot and toes and dorsiflexion of the foot was present in 100 per cent and dorsiflexion of the toes in 5 per cent of the animals. After 150 days this percentage dropped to 65 per cent for plantar flexion of the foot and toes and dorsiflexion of the toes and to 35 per cent for dorsiflexion of the foot.

The accompanying chart shows in percentage the average score of total electrical response for all the animals in the septic and aseptic autogenous and homogenous grafts. The discrepancy between the percentage curve of the septic and a septic homogenous grafts may be related to the severity of the infection in individual cases and the relatively small number of animals with septic homogenous grafts that were studied.

SUMMARY

Infection at the site of repair of a severed peripheral nerve increases the amount of ad

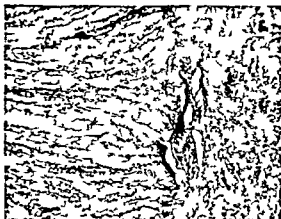


Fig 4 S d d f th t l gm t f th
t d y ft t th b m ty
D g t d p t h f t m d
beg g ll l f t Th t d l t b
l d ff by p l f t d f t d m od m l t h h
g f m th p m t th g p t bet
th t l d d t l d Th fect did t
pe t t t th f l (Bod f h t
X oo)

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F 5 R t t fib gth t l
4 d y ft t g ly f t d h d Th y l l
th p th f tgr g t b l l t l l file
l t b ss p t b l th th k d pe
n m t th b t t m f th ph t ph (Bod
f ch t X 300)

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Fig 6 C o s e t f f ted r v 4 d y aft
t h b s c e s s th th l
t t f s c l h u h d d by ta per
n m Th f s c l t d t bed by th p es
f th d n f e c t (Bod an f h s t a m
X)



F 7 S p t t g ft 4 l y s ft t pl
tati h m t l f b e l
l g m t f f l d p o t p o d t b e e
th m Th m k e d p l f t f th p e
b t m n f f e c t th th f s c l (Bod
f h s t a m X)

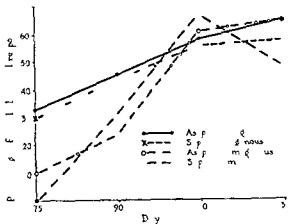


Fig 8 Sept h m g g ft d f m b-
 es ly d y ft t l t t Th e
 f sc l fll l th my l d mpo t p o d t
 h h g d pe sc l ly phocyt fil t
 A d t Th d eurium hyperpl t l th t
 f sc l f n d f t d d t m h
 h h g d foc f lymphocyt (Bod f h
 t X 9)

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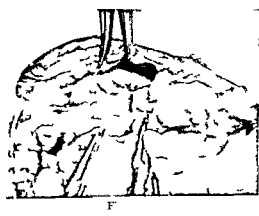
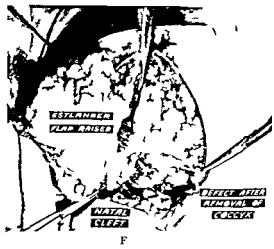
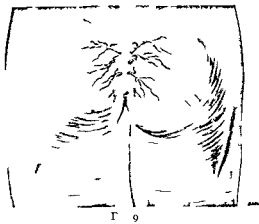
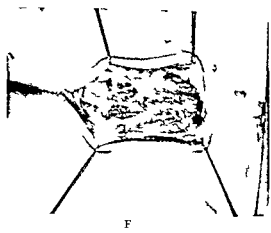
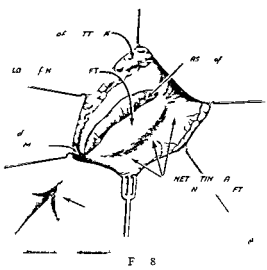
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F 8 D f l p t p t ft c
f pl d l f th l t f th sel t th
t l l f f
F 9 Th l f th tal l ft th p t
p r t sa l l f m th sa l f m
F N t th post f th h m t t Th
t p e t t d l t l t th m d l Th
l t y d t th f t t t th s p h b d
F Th k d m l l th th b e ta
w d h th p e t p h t r p h t
F Th p e t d f t d flap cu t
p l m d ! h h m l f th o c y d f p
t f th f s c p p f th t m s a y
Th ca ty H b l d th l f t N t h th
f t f th t t d g l t l d p l th t l d f t th
t t n s

ticular care is necessary to ensure the complete division of the natal cleft fascia along the medial border of the flap *sglt* down to its *lor* er angle at the tip of the *coccyx* otherwise the object of the operation will be defeated and



Fig 1

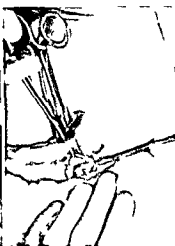


Fig 3



Fig 4

Fig 2 Th f k s f t m k e d t
f l y t h g t l t k
Fig 3 Th f d k j t f f b l o o d l y m p l g

po g d t h f g t p Th l s o p d e s t t
l h 4 O p e t d f t h m t t f
t t l p p o e d f l a p d g t l t k

dead space will result in the coccygeal zone because the gluteal fat cannot enter the defect.

This operation is a plastic operation. The handling of the flap with ordinary surgical instruments is to be avoided and fine hooks or guy sutures alone should be employed.

Hemostasis must be perfect and only very fine plain catgut is permissible (No 0000) as a ligature material. Four or five mattress su-

tures of fine silk pass through the skin and fat of one side about $\frac{1}{4}$ inch from the skin edge pick up the sacral ligaments and emerge through the fat and skin of the flap (Fig 16).

It is important to ensure that the suture when tied will draw a quantity of the fat of the flap into the dead space. These sutures are placed and left long but not tied as they are subsequently employed to fix an anchor

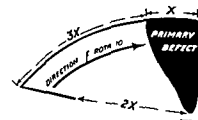
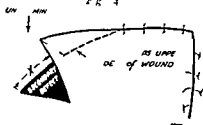


Fig 15



Fig 16



SURGERY GYNECOLOGY AND OBSTETRICS

TABLE I—SUMMARY OF 5 CASES

Case	Degree of inflammation	People	Period	Position	Comments		Findings
					Local	Systemic	
1	Acute inflammation of the d. gree	Female	5 days	da	Local	Local	Red, healed
2	d. discha. g.	N.I.	8 da	da	N.I.	N.I.	Red, healed
3	d. discha. g.	N.I.	4 da	da	m. l. h. m. m.	N.I.	Red, healed
4	d. discha. g.	N.I.	d	da	m. l. h. m. m.	N.I.	Red, healed
5	d. discha. g.	N.I.	da	da	N.I.	N.I.	Red, healed
6	d. discha. g.	N.I.	Sec. dary A. di. nse ed. pe	d. primary	N.I.	Local	Red, healed
7	d. discha. g.	N.I.	Sec. dary pe. curr. A. di. nse ed. h. da. rim. ry	red f.	N.I.	Local	Red, healed
8	d. discha. g.	N.I.	Sec. dary h. da. m. ry. A. rich. qu. ed. nse ed.	red f.	N.I.	Local	Red, healed
9	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
10	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
11	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
12	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
13	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
14	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
15	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
16	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
17	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
18	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
19	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
20	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
21	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
22	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
23	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
24	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
25	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
26	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
27	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
28	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
29	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
30	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
31	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
32	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
33	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
34	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
35	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
36	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
37	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
38	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
39	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
40	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
41	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
42	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
43	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
44	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
45	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
46	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
47	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
48	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
49	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed
50	d. discha. g.	N.I.	da	da	N.I.	Local	Red, healed

TABLE I—SUMMARY OF 5 CASES—Continued

Case	D g of ad f us	P eop e period	P od i hosp ital postopera ve	Com l		F il l p
				U d fla	U d tal w und	
4, d. schäfer	Recurre al		Ilun! 7 da ca m	Sm ll h ma m d fl p	Sm ll pe f J un b ! d mod l w und h l	S ll d m
3	d. disch ge	N l	d y	N l	N l	Il l d d scha from hosp ital
	I, disch A' archel Rec l W ll R rr f p e y pe ion	N l	day	S ll d m	S ll d re m	S ll und m
	T or h l f f na l i f f llo gu ho ou l f ca la na y re bel	P g l l l f m f n o c m d	day	N l	N l	F' m l h led

W l lo dal us f d ed lo l l f
 Grad pl dal us re li g l mba uch orectal reg n s

dressing One to two grams of sulfanilamide powder are dusted into the wound

A second series of similar mattress sutures lying between the first series are inserted but pick up each skin edge and are tied as inserted. We stress this precaution because accurate apposition of the cutaneous edges is very important (Figs 17-18). It is essential to see that the dead space is closed at the tip of the coccyx as this point may be overlooked. These sutures are continued along the upper border of the flap to close the buttock wound.

At the re-entrant angle of the flap 2 cubic centimeters of plasma (group O) and 2 cubic centimeters of thrombin topical are separately inserted. On occasions we have mixed 1000 to 15000 units of penicillin with the plasma. The flap is lightly compressed to ensure spread of the solutions and held for 1 minute until the fibrin forms. An assistant now maintains pressure on the flap until the secondary defect is closed. With small flaps direct suture suffices (Fig. 18). The delicate fibrin ration of the flap should not at this stage be disturbed by rough suturing or other manipulation. Hemostasis has thus been most satisfactorily effected in our cases—an important prophylactic against hematoma formation under the flap which has been our most frequent complication of this method.

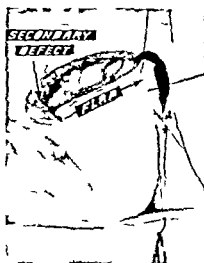
With large flap the secondary defect is more extensive and requires a Z-plastic (Figs

18-19). Where the rotating re-entrant angle overlaps the upper border of the wound a Z-flap is cut the angle being let into the upper border and the relaxation of the upper edge now permits closure of the wound (Fig. 14).

The anchor dressing is tied in place and no further wound dressing is employed. A superficial pad is fixed in place with elastoplast. The patient is permitted to lie on his back if he so desires. The bowel are opened as soon as the patient begins to experience any abdominal discomfort. The anchor dressing is removed on the twelfth day and the patient is kept in bed for 21 days. A careful watch



Fig. 5. The first mattress suture is tied. The Gilchrist hook is used to pull the flap into position.



F 6



Fg



F 8



F 9



Fg



F 11

F 6 E l d t t f p des oned d d
p ocess f t t bed N t th ec d r d fect
Fg Th m dl d h be d th
h d d th f p d p ocess f)
F 8 Clos f ec dary d fect b Z pl
pe tu

F o Z pl t p t m pl t d
F o f d f t p b f f l l l l l
cu h t d f d i t l m y p
ly
t h Clos by tat d p H l g b p m)
t t

must be maintained for the occurrence of a hematoma under the buttock flap. Should this occur and be overlooked infection may supervene. The natal cleft has healed by first intention in 18 of our last 21 cases and remained healed. Hematoma occurred under the buttock flap in 6 cases but not in any case in which fibrin fixation was employed. In cases the hematoma became infected and drained streptococcal pus for 10 days but was readily controlled with local penicillin therapy.

The method was employed recently to close a trophic infected sacrococcygeal ulcer of 2 years duration resulting from a gunshot wound of the cauda equina with anesthesia of the third fourth and fifth sacral segments. Local penicillin therapy was used prophylactically for 14 days. Healing occurred by first intention.

The resiliency and firmness of the flap at the third month have been striking in the cases which have been followed up for that period. Some patients complain of tenderness of the flap for a few weeks but the majority state that no symptoms exist.

The method is presented in the hope that those having access to a large number of cases will afford it a fair trial. As with all plastic procedure a careful and meticulous technique pays large dividends.

SUMMARY

1. The irregularity of the embryonic epithelium of the natal cleft and the persistence of natal dimples in young adults supports the theory that pilonidal sinuses are tubular remnant of the natal cleft.

2. The very high incidence among service personnel suggests that the vigorous and unhygienic conditions of service life may be important contributory factors.

3. The growth of the sinus into the fascia of the natal cleft is described. The anatomical disposition of this fascia governs the primary spread of the sinus.

4. The natal cleft possesses a poor blood supply derived mainly from small medial twigs of the posterior perforating arteries from the sacral foramina. Secondary tracks of the sinus may enter the buttock along these twigs.

5. In all except the smallest operative defects closure by direct suture is inadvisable because the rigidity of the buttock fascia prevents free approximation in the subcutaneous wound.

6. A method is described which has a wide application, avoids tension, introduces a new blood supply and permits restoration of the natal cleft. The pitfalls of the method are emphasized.

7. The difficulties and travail experienced in 4 cases of large infected pilonidal sinuses treated by this method are epitomized.

As the following table shows, the results of the treatment of pilonidal sinuses by the method described are very satisfactory. The results are summarized in the following table.

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LACERATIONS OF THE PERINEUM AND THEIR REPAIR

A Study Based on 2375 Personal Cases

LOUIS E PHANEUF MD S D FACS B t M s ch s t t

LACERATION of the perineum is one of the commonest lesions in gynecology. With the exception of the few cases which may be due to external trauma this disorder is the result of childbirth and occurs during the passage of the fetal head through the vagina and the vaginal outlet. The repair of the damaged birth canal has led to a voluminous literature and to the proposal of many operative procedures some of which are ill advised.

Lacerations of the perineum are divided into recent lacerations or tears seen at the time of childbirth and old or remote lacerations in which healing has been left to nature and scar tissue has formed between the edges of the torn structures. Those of the first group are known as obstetrical lacerations of the perineum and are divided into three degrees. In the first degree only the mucosa of the vagina is involved and the perineal muscles escape. In the second degree the vaginal mucosa and perineal muscles are involved. In the third degree the vaginal mucosa, the perineal muscles, the sphincter ani muscle and not infrequently the rectovaginal septum are included in the process. Lacerations of the second group comprise the so-called gynecologic lacerations. They are referred to as incomplete when the tear extends through the perineal body but not through the sphincter ani muscle and rectovaginal septum, and as complete when the two last mentioned structures are damaged.

The gynecologist and surgeon also have to deal with still another form of injury to the pelvic floor, namely the relaxed vaginal outlet in which there was no apparent external tear at the time of childbirth but separation of the muscular and fascial structures existed under the intact mucosa and skin. This disorder is usually accompanied by protrusion of the rectum between the separated supporting planes. This protrusion is referred to as a rectocele and arises in connection with the loss of support.

Repair of the lacerated perineum or damaged pelvic floor may be classified as immediate or inter-

mediate and late repair or perineorrhaphy. Primary repair is carried out at the time of childbirth and should be done whenever the surroundings are suitable. Injuries to the pelvic floor are generally sutured in hospital deliveries. The current practice of episiotomy or incision of the perineum extensively employed during the last two decades has prevented the jagged and multiple lacerations which were encountered before this simple measure was adopted. A straight incision placed by the obstetrician where he wants it to be is simpler to suture than an irregular tear and the result obtained is far superior to that of the irregular tear which may occur when conditions are left to nature.

Improvement in the repair of recent injuries to the pelvic floor has come through the improvement of suture material in general and by the use of fine suture material. Nowadays a strand of No. 0 chromic catgut is found to be adequate in suture pairs where formerly a strand of No. 2 chromic catgut was used. The involved planes of the pelvic floor are approximated in layers, the keynote being accurate approximation without tension. The mass approximation of all structures with large nonabsorbable threads and through sutures which leads to a firm resistant frequently painful and thick perineal body is not practiced by well trained operators. When such a method has been employed it is not unusual to find painful and extensive scars across the skin as the result of sutures too tightly tied. Opinion is divided as to the proper method of closing the skin in an episiotomy or recent repair of the perineum. There are those who advocate the use of fine catgut in the form of a subcuticular stitch, continuous suture, loose set or interrupted sutures, and those who believe that interrupted sutures of fine silk prepared in nylon, the so-called absorbable material add a sense of security since it not infrequently occurs that the fine catgut sutures constantly bathed in the lochia absorb prematurely and cause separation of the skin edges before healing has been completed. Episiotomies are described as median when the incision is made in the perineal body, the median line and as midlateral and lateral right or left when the incision is placed on one side of the other of the median line. Since the epis-

F m b D p r t m f b j l g r T l s t l l Med al
hoof d b D partum f Ob and Gyn col gy Car
ex llo al
R d b f h n w e l a d (b t r i c a l d G n r l g a l)
soci B Decemb 944

more tension on the edges of the lateral incision than exists in the median fine silk or nylon sutures offer a certain advantage in closing the laceration in the further type of incision. The repair of recent injuries of the perineum is usually very satisfactory if in tying the deep sutures tension has been avoided.

Intermediate repair of recent perineal injuries has never attained much vogue and has had but little place in the obstetrician's armamentarium since most lacerations and incisions are repaired at the time of childbirth. However there are occasions when the condition of the parturient because of a long exhausting labor hemorrhage difficult delivery and poor surroundings for performing immediate repair makes it inadvisable to reconstruct the perineum at the time of the delivery. In this group of patients the choice rests between intermediate repair and the performance of a gynecologic operation 3 months or more following parturition after the perineum has been allowed to heal by scar tissue. Intermediate repair is commonly carried out 10 days after childbirth. The parts are prepared with a nonirritating germicidal solution, the granulation tissue is curetted from the torn edges and approximation is carried out by means of loosely tied sutures of fine catgut in the deep tissues and those of nonabsorbable material in the skin.

The late repair of lacerations of the pelvic floor with or without accompanying rectocele is performed by the gynecologist or surgeon when healing of the torn tissues has taken place by scar tissue and an involution of the involved structures after parturition has been accomplished. It is a wise plan to allow at least 3 months to elapse after childbirth before such an operation is attempted. Neglected lesions, perineal lacerations and a relaxed vaginal outlet with concomitant rectocele and enterocele not infrequently come to the gynecologist or surgeon many years after the original accident. 25 and even 50 years sometimes having elapsed in my experience. Furthermore perineorrhaphy is seldom performed as a single operation rather it is performed in connection with other operations for prolapse in connection with hysterectomy and with other gynecologic interventions.

An examination of the nulliparous perineum reveals that it is elastic gives adequate support and is not painful to laceration. In reconstructing the pelvic floor the operator should aim insofar as possible to restore the parts to their original form. This purpose can be accomplished by layer approximation with tension of the tissues and by the employment of fine suture material it is defeated

by the approximation of all the structures in one layer by large nonabsorbable sutures.

TECHNIQUE OF SECONDARY PERINEORRHAPHY

Having previously described and illustrated the technique of the operation for complete tears of the perineum as I perform it (1, 2) I will limit my description at this time to the technique of performing late or secondary perineorrhaphy for incomplete tears.

Preoperative preparation. Two nights before entering the hospital the patient takes a saline cathartic in the form of magnesium sulfate or sodium phosphate or solution of citrate of magnesium. After the bowels have been thoroughly evacuated she remains on a light diet until admission. The afternoon before operation the external genitalia are shaved and gently scrubbed with gauze and tincture of green soap particular attention being paid to the anus to the folds about the vulva and to the mons veneris. The parts are then rinsed with sterile water and with nonirritating potassium mercuric iodide solution 1:1000. A vaginal douche is given consisting of 2 drachms (8 gm.) of compound zinc sulfate powder (National Formulary VII) in 2 quarts (2 liters) of warm water. A soap and water enema is administered the afternoon or evening before operation but not on the morning of operation. After the induction of anesthesia the parts are prepared in the operating room by cleaning the external genitalia with ether and painting them with tincture of zephiran and by painting the vagina with tincture of zephiran. In the presence of considerable vaginal discharge the vulva and vagina are gently scrubbed with tincture of green soap and warm water rinsed with 1:1000 potassium mercuric iodide solution and painted with tincture of zephiran. The sterile drapings are applied and the anus is covered with a sterile gauze sponge which is held in place by means of two towel clips.

Operative procedure. A self retaining perineal retractor is used to spread the labia apart. Preference is given to the Friedman type of retractor but if this is not available a Gelpi retractor may be used. Another satisfactory method of exposing the parts consists of using fine silk sutures held in hemostats on each side of the vulva and at the posterior commissure. The advantage of using self retaining retractors is that this leaves the hands of the assistants unencumbered. The pelvic floor is opened at the mucocutaneous border. This may be done with Fernet scissors (Fig. 1). Mayo scissors or a scalpel. The posterior margin of the incision is held in the median line with an All



F



Fg



F 3



F 4

Fg A I dm lf t n g t t t o d d
d d j ted t po th pe ti h ld A t p f t
t th m oc t co bo d m ed th Emm t sc s
r st v pose th d p tru t es
Fg Th l ed g f th h ld th T
f ps d th po t n i l l p ted f m th
ect d th pen l m scles by h rp d bl t d se

t by th g d fi g Th g uz m tt l
the ll t t f th k f l nty
F 3 Th d se t lm t mpl ted Th t
d th pe lm l th d pth f th d
F 4 Th d t mpl t d Th f th
p bococcyg scl se d ply th l f
th t m

forceps and the posterior vaginal wall is separated from the rectum and the perineal muscles by sharp and blunt dissection using the gauze covered fingers (Fig.). In the illustration for greater clarity the gauze is not included. Figure 3 shows this part of the dissection almost completed and Figure 4 shows the completed dissection. The separation of the posterior vaginal wall from the rectum and the perineal muscles is facilitated by using a Tenet's forceps which holds the

vaginal wall firmly and does not slip. The perineum is then reconstructed by approximating four layers of tissue. The crus of the pubococcygeus muscles which are attached to the levator ani muscles are approximated in the median line by three interrupted sutures of No. 0 chromic catgut to narrow the space between the two medial margins of the levator ani muscles and to overcome the ectocele (Fig. 5). The second layer comprises the urogenital diaphragm made up of the deep



Fig 5

I g 5 Th c f th p bococ yg l p-
p t tel w th th h t es f h m t g t
h t n f th p bococ yg sel sh bee
ll ted Th t f th perat h d the
t bet th t ed lm g f th l t
m scles d th th toc l Th ee t es f o

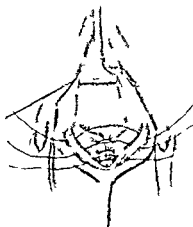


Fig 6

ch m t g t a pl ed n th tal d phrag
d p f th d f t rs pe l d t
g f sc a d f t t el Th l f the t es
h ld h t t
f g 7 Th es f th post n g l ll
cted th f m f t gl th th pe t th est
f th rectoc l Och l p ed h s d Th
Och l mps tted f th fl p ll

Fig 7

trans ersus perinei muscle and its covering fas-
ciae. Three sutures of the same material are
placed in these structures and left untied (Fig 6).
A triangle of the posterior vaginal wall with the
apex at the crest of the rectocut is resected. When
there is considerable redundancy, this is facilitated
by the use of Ochsner clamps on each side but
they may be omitted if the opposite condition
exists (Fig 7). The vaginal part of the incision is
closed with interrupted sutures of No. 00 chromic
catgut (Fig 8) and the three sutures in the
urogenital triangle are tied and cut. The skin
edge is freed from the underlying scar tissue so
that it can be approximated later without tension,
an important desideratum when fine catgut is
used in the skin (Fig 9). The third layer consist-
ing of Colles fascia is united with a continuous
suture of No. 00 chromic catgut (Fig 10). The
skin forms the fourth layer and is approximated
with a running suture of No. 00 chromic catgut,
the ends of which are arrested with clamps. At
the lower angle of the skin incision there is always
columnar tissue which if not removed appears
as a protuberance. It is important to resect this
tissue in order to leave a flat surface when the
suture is completed (Fig 11). At the completion
of the operation of perineorrhaphy the only part
that shows is the 25 to 50 centimeters of skin

which covers the operative field. Many operators
pay little attention to this skin and in closing it
leave dog ears, uneven surfaces and a protuber-
ance at the lower angle of the incision. Using
lead shots instead of tying the sutures and resect-
ing the skin at the lower angle of the incision re-
sults in a flat, even surface giving a satisfactory
plastic result. The vagina is loosely packed with
iodoform gauze, the end of which is held by a silk
suture attached to the inner aspect of the thigh
by a small piece of ahesive plaster. This step in
the procedure greatly facilitates the finding of
the gauze for removal at the end of 24 hours
(Fig 12).

Postoperative care. Morphine and codeine are
prescribed in sufficient amounts to allay pain. The
suture line is painted with 4 per cent aqueous
mercurochrome or aqueous solution of zephiran
after each micturition and defecation. Forty-
eight hours after operation a daily douche of com-
pound zinc sulfate powder (National Formulary
VII) 1 drachm (4 gm.) in 1 quart (1000 cc.) of
sterile water is given and this treatment is
repeated daily as long as the patient remains in
the hospital. A No. 22 French male soft rubber
catheter is used as a douche tip. If catheterization
is necessary in the first few days after operation,
great care should be used in separating the labia



F 8 The p t r e l l l ed th t rupted t es f \ h m t
 F 8 Th Lu p t d f m th d b g c r t s s o s t m l l t
 f m th l u n e d g e s A \ B d P k b l d e d th d s e t
 F t C l l e s f e c p p m t e d b y t t f \ o o h o m t t

to expose the urinary meatus since the upper part of the incision is held by fine catgut sutures and may separate if force is used. The bowels are moved on the third postoperative day. A fairly generous diet is given on the fifth postoperative day. The patient is allowed out of bed on the morning of the twelfth day and is discharged from the hospital on the fourteenth day after operation.

STATISTICS

From May 97 to June 30 944 app oxi-
 mately 7 years I have operated on 328 women
 for lacerations or incisions of the perineum. In
 this series there were 156 gynecologic or sec-
 ondary operations on the perineum and 77 ob-
 stetric or primary operations.

The gynecologic or secondary repairs were clas-
 sified as follows:

	N	f
Perineal haphy f	448	
P haphy f		
l l u perat u	6	
f f th u f th pen m		
T t l	6	

The obstetric repairs were classified as follows:

	N	f
Fp t my	8	
Left		
Media		
Right		

R p a i f l c t r y n f m l l t
 th m s a t e c d d g r t
 R p a i f t h d d g r e e t
 T t l

367
 9
 77

Results All these patients obtained satis-
 factory perineal support. During the days when
 the large suture material was used there was separa-
 tion of the superficial tissues in a small group of
 cases. The exact number of which was not deter-
 mined. In these patients healing was by second
 intention.

Mortality In this series of 2328 cases there
 were 14 deaths, 1 gynecologic and obstetric a
 gross mortality of 0.6 per cent. The detail of
 these deaths are given in the following case sum-
 mary.

GYNECOLOGIC DEATHS

Case Ope ti perf med A gu t s 92
 and nsted f mp tat f th ix (St rnd d
 per n h phy p g lhy t ect my d ppe d
 t my Th p u t d ied A ou t 4 f h k d j oc
 d i s

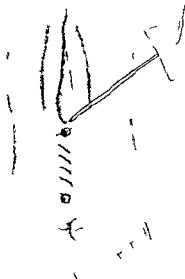
Case Ope ti s perf med J ry 9
 and nsted f d i l t a t d c t t a b l t l t h
 l h phy per n cor r h a p h y p g l h y t t y
 d b l i p g o o p h t m y d p p e d t m y Th
 p u t d e d n J ry 7 f r y p e l d p m

Case 3 Ope ti perf med M h 99
 d nsted f g l h y s t m y d p e
 h a p h y Th p u t d ied M h f e p t m u Th
 b l o o d c u l t h w e d St p t o c o c h m l y t u s

Case 4 Ope ti perf med M y 3 93
 c nsted f d i c a l u f c y s t o c l d p e c o r r h y
 Th p u t d ied M y 5 f p l m n a r y m b o l



Fig



Fig

Fig Th k losed th ru s t f n oo h catg t Th
ed d t k th f f p t be t th l gl of th
t i so th t th k d, ll be f t Th fl d h t p ts g th k
edges d t h h occu he ty g th k t re
Fig Th pe h be ec tru ted f l y rs Th f t l y
s t f th p bococ y g m l th d l y f th u g tal d ph g th
th l l y f C lles f sc d th f th l y f the k l lose od f n g
f k pl d th g f 4 h A lk th d t ed t th l f th
g l h l l t th n pe t f th th gh by s ll p f a th plast
t f l t t f d g th d f th g f l

C 5 Ope t pe f ed o M y 6 03 l t f th p l p d t m Th l t u n t d ed Oct be
ted f t t l porrh phy pe h th y d 7 f br l h r rh g
M l f b h p C ted f g l hyst t y f t f th b oal
C se 6 Ope t perf rm l J 934 d l gam ts t th les f th g t r l po h phy
ted f pe eorh phy d f pe lect my th l pe r rh phy Th f t t d ed M y f
ll c t Th l t t d ed J 4 f a f l
C se 7 Ope t pe f ed Oct l 3 3 l t d f d lat t d u t tag ut t f
l ted f g l hyst ect my l pe th l of the r y m t t o l po h
h hy Th p t d ed N be b th t psy pl pe h hy d t gr d ppendect y th gh
h ed pe t t seco l y h h g f th ght ed f l t l so h d h l ecy t t
ry l j h t b scss l h l l th Th p t t d ed Ap l 3 d n g
C se 8 Ope t f f l O t be 3 3 t k f g l l l l ad d sease
l t l f t l porrh phy pe eo h phy In th group of 12 patients the perineorrhaphy
lyw f th d pra g l hyst ect y Th was d ne as a complement of an extensive gynecologic operation The deaths vere due to the ex
t u t t ed N be b d l ped uni th tensive disease for v l ich the main operations were
t l th post pe t d y Th mp ed f t t performed rather tlan to the perm r rhaphy In
t h l l ped b ax l y l sc h ght no case was tle perineorrhaphy v l performed as a
l l l g g f l t t th ex l f feet s gle operat on
C se 9 Ope t f f l J l 38 l
l ted f t l hyst ect y (M y t 7 38 eo
h hy f t t l J l y o f b h t
C se 10 Ope t perf rm l Sept ber
l 10 l t f g l h t rect u y (M y type)
repa f mplt l l erat f th pe d red

OB TH TRIC DEATHS

C se Del y J l 0 8 l ted f f
ps t th h d ht an l p t l d on p t

I t f th pe um Th p ti t died J ly 9 f
m p lm ry mbolu Sh had bee t f bed f
3 d y d p p r t l f h h m th d y
f h d th
C D l ry Sept mbe 4 94 d ted
f tt mpted f ps rs d t t d
seco d d g ee p r h phy o p m p a Th p t t
d d Sept mbe f po tp t m h m r rh g hock
nd a d ff ci y
It bel ed th t th pen h phy th bst t
d th n t m j sati f t

CONCLU IONS

The success of the operat on of perineorrhaphy depends on careful preparation of the operative field and the maintenance of a r e d ase p is sharp rather than blunt dissection whenever feasible to

avoid bruising the tissues the approximation of the tissues in layers (we prefer four layers) rather than mass approximation since this maintains suppleness and elasticity as well as supports and avoids painful rigidity employment of fine suture material and accurate approximation of the tissues without tension and carefully planned and executed postoperative care

A series of 238 personal cases is reported in brief

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THE FASCIA OF THE DORSUM OF THE HAND

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FRANKLIN I. ASHLEY, M.D. JACK DYKES, M.D. Chicago, Illinois

THE texture, contents and relations of the fascial layers which cover the dorsum of the hand are of interest alike to the anatomist and to the surgeon. Kanavel's discussions which are essentially surgical contributed more to our knowledge of the layers and spaces of the dorsum of the hand than does any anatomical account. In a recent study of these strata and the compartments bounded by them, the present authors made observations on manual structure which now allow them to add anatomic detail to Kanavel's classical account. These will be described in detail and illustrated by selective dissections.

MATERIALS AND METHODS

The dorsal layer of the hand was studied in several specially dissected specimens and then in more than twenty-five hands in the students' laboratory. After the scheme of stratification had been established, two specimens were prepared for illustrations, one showing the layer opened from the surface inward (Fig. 1), the other depicting them as seen in cut-back section (Fig. 2).

LITERATURE

Of the various textbook accounts that of Quain is the most satisfactory. Quain, however, describes only two layers; the outer one is said to contain the dorsal annular ligament and distally to become continuous with the extensor tendons on the fingers; the inner layer is stretched over the intermetacarpal spaces and is adherent to the subjacent bones and interosseous muscles. These two lamellae, according to Quain, are continuous with each other in the intervals separating the tendons at the digital clefts between the two courses the extensor tendons and their beths. In the standard textbooks only the ligamentous thickening are described, mentioning none of the membranous structures.

Mason and Koch in their report on human bite infections of the hand describe the dorsal fascial compartments of the hand, but with peculiar reference to the problem of infection.

In Kanavel's treatise based upon sectioned and injected material, areas of interfascial space are demonstrated. Since these spaces, two in number, possess definite marginal boundaries, they can spread within them over the entire dorsal aspect of the hand. The more important one of these superimposed compartments is situated beneath the extensor tendons and upon the metacarpal bones and the interossei.

OBSERVATIONS AND DISCUSSION

In studies of fascial and aponeurotic strata such as those just described, the thicker layers stand out prominently on cut surfaces and appear as membranes bounding injected masses. However, the layers may be clarified by careful dissection; this procedure serving to establish continuities and to demonstrate regional differences in texture and attachment.

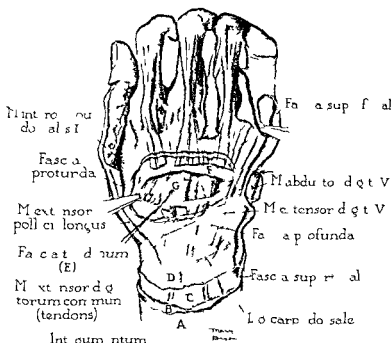
The several strata which were invariably evident in the authors' specimens will now be considered in succession from the integument to the interosseous musculature.

Integument. The integument over the dorsum of the hand and digits (Figs. 1 and 2, layer 1) is thin in a comparison with that of the palm. It is loosely attached to the underlying fascia, a circumstance which permits of considerable freedom of movement of the skin over the subjacent tissues.

Layer of superficial fascia. The superficial fascia of the dorsum of the hand is two-layered. The superficial layer is thin and somewhat fatty in consistency (Figs. 1 and 2 at B); it contains only a few vessels which pierce it on their way to the skin. In spare specimens this layer is very thin and may be separately demonstrable over the entire dorsum of the hand.

Deep layer of superficial fascia. The deeper stratum is almost always the more definite of the two. It is of uniform thickness over the entire dorsum of the hand (Figs. 1 and 2 at C). This layer transmits the superficial vessels and the cutaneous nerves. At the web of the fingers and at the margins of the hand the two layers are no longer distinct; conjoined they become continuous.

The observations reported tend, several years, to show that the separation of the layers is not complete, but that the layers are separate in the interdigital spaces. The layers are separate in the interdigital spaces. The layers are separate in the interdigital spaces.



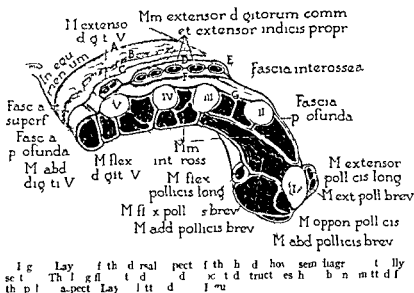
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dorsum of the hand becomes continuous with the equivalent layer on the palm (Fig. 1 tag of fascia cut and held by forceps). Fusion of the supratendinous fascia (layer D) and the infratendinous fascia (layer I) occurs at the clefts between the fingers over the phalanges and at the sides of the metacarpal part of the hand so as to form a definite circumcised compartment (hereinafter).

Fascia of extensor tend. Under the layer just described and resting upon another equally distinct there occurs a fascial investment for the extensor tendons and their synovial sheath (Figs. 1 and 2 at E). Marginally it is a single layer but when tendons are encountered it splits to enclose them. The layer is thin yet readily dissectable. When exposed by reflection of the supratendinous fascia it appears as a fascial plate attached medially and laterally to the compartment walls. It is so distally where at each metacarpophalangeal joint it becomes part of the fibrous investment of the dorsal tendinous expansion proximally it is prolonged on the extensor tendons to become in the forearm the perimysial investment of the extensor muscles. In passing from the manual into the antibrachial region this enveloping fascia for the tendons lies beneath the dorsal carpal ligament—which latter is a locally specialized part of the supratendinous fascia—it rests upon an equally strong layer suitable for purpose. It even receives in recording topography all the essential may be referred to as the infratendinous fascia.

Infratendinous fascia. The infratendinous fascia is the firmest layer on the dorsum of the hand

(Fig. 1 at F lifted by forceps on radial side of hand). The layer is situated next below the thin fascial envelope of the tendons. Over the carpus the infratendinous fascia is fused with the periosteum and ligaments of the carpal bones. At the level of the carpometacarpal joints the fascia becomes a distinct layer bridging the metacarpal bones. There it is fused laterally to the dorsum of metacarpal II and medially to metacarpal V. In these areas it then continues its spread marginally where in conjunction with the supratendinous fascia it becomes the investing fascia of the first dorsal interosseous and of the abductor of the fifth finger on the radial and ulnar sides of the hand respectively. On its deep aspect the fascia in some specimens is attached to the other metacarpal bones (namely III and IV) with the result that the subjacent space—between the infratendinous layer and that covering the interosseous muscles—is locally and partially subdivided into lesser spaces.

Thus the supratendinous fascia and infratendinous layer fused along the sides and the distal extremity of the metacarpus are the walls of a compartment in which the extensor tendons are suspended by a special membranous sheet which subdivides the whole compartment into two superimposed portions. At the wrist where the outer (supratendinous) layer is continuous with the antibrachial fascia across the dorsal carpal ligament and the inner layer is continuous with the bones ligament and articular capsules at the wrist joint the compartment is essentially closed through fusion of the constituent layers with the

ligamentous wall of the several canals which transmit the extensor tendons into the hand. Within these canals the tendons are covered by their separate portions of the layer which as a fascial plate splits to enclose them in the hand. Since the segregated portions are then prolonged into the forearm to become perimysial investments of the extensor muscles the fascia of the tendons would be expected to be separate from the surrounding walls of the canals. Actually, however, some fusion occurs so that the carpalos dorsal compartment is not continuous with the antibrachial spaces which lie within the dorsal sleeve of fascia.

Interosseous fascia. The interosseous stratum immediately beneath the infratendinous layer and can be separated from it by blunt dissection (Figs 1 and 2 lifted by hook.) A loose areolar tissue sometimes containing a slight amount of fat separates these two layers of fascia. The interosseous fascia is fused with each of the metacarpal bones and is intimately adherent to the interosseous muscles which take their origin in part from its deep aspect. The layer is thin and is essentially a perimysium for the interosseous muscle to that which surrounds the sacrospinalis muscle within the lumbodorsal aponeurosis and the rectus muscle within its sheath. Distally, the fascia ensheathes the tendons of the interosseous, finally reaching the dorsal tendinous expansions of the digits. In so doing it fuses with the several layers previously described which are carried outward upon the extensor tendons.

CONCLUSIONS

Conventional accounts of dorsal manual structure describe only two layers situated at subcutaneous and osseous levels. The former are termed superficial and deep fasciae. But in careful dissections of the hand a much more complex arrangement of layers is encountered related chiefly to the extensor tendons.

Both the superficial fascia and the deep fascia are bilaminar. The layers of the superficial are like the corresponding strata of the innominate and other osseous fatty and membranous. The layers of the deep fascia are not only non-fatty but heavily and sufficiently banded to be considered aponeurotic. These are placed proximal and beneath the extensor tendons and the latter proper fascial coat. The supratendinous layer is continuous with the wrist with the antibrachial fascia in it is divided the dorsal carpal ligament the infratendinous layer rest upon the bones of the hand. Whereas then in the forearm the deep fascia is a sleeve for the extensor muscle—between adja-

cent members of which it is seen septa in articulation with the hand it forms a compact investment for the tendons of the same muscles assuming the character of an envelope flattened against the metacarpal bones and intervening (interosseous) muscles. To either side of the long tendons on the dorsum of the hand these two layers of the deep fascia fuse, thus while the deep fascia is bilaminar though the greater part of its manual extent it is single layered on the ulnar and radial sides of the carpus. In the former situation it becomes the investing fascia of the first interosseous muscle while in the latter position it serves similarly for the abductor of the fifth digit. Distally the two meet at metacarpophalangeal level to close the compartment in front, on the phalangeal prolongations enclose and fuse with the dorsal tendinous expansions proximally their fibrous tissue becomes part of the ligamentous tissue lining the sulci on the extremities of the radius and ulna.

In the antibrachial region the extensor muscles are closely invested by a perimysial sheath. Comparably in the dorsal manual compartment (formed by splitting of the deep fascia) the perimysial tissue is broadened to produce a thin transverse septum which splits to enclose the extensor tendons. It is fastened at each side to attachment to the side walls of the compartment where the supratendinous meets the infratendinous layer of fascia. It is the immedialate covering of the synovial sheaths.

The infratendinous layer of the deep fascia serves also as a thick sheath for the interosseous muscles. As in the structure of sheaths generally the layer next below—immediately covering the muscles—is thin. Just as the rectus muscle within its aponeurotic sheath is surrounded by a layer of perimysial nature so the interosseous below the infratendinous stratum are covered by an excessively thin fascia. One of the metacarpal bones the interosseous fascia fuses with the periosteum of the carp metacarpal and metacarpophalangeal joints the layer becomes part of the capsular tissue of the articulations.

The present author would identify the superficial and deep processes of Kanavel's description as the carpal plates above and below the layers of the dorsal compartment. One of these would be situated between the deep layer of superficial fascia and the supratendinous division of the deep fascia while the other would lie between the infratendinous portion of the deep fascia and the fascia of the interosseous muscles. Both of these processes are separated from the dorsal compartment neither corresponds structurally to the

metatarsal compartment on the opposite aspect of the hand

In the most frequent type of infection of the dorsum of the hand as described in the excellent accounts by Kanavel, Mason and Koch the spaces not the compartment could be affected. In infections caused by lacerating injuries in the carpal region however it would be expected that the synovial sheaths and the surrounding compartment would be involved. Such cases should

be studied further in relation to the arrangement of dorsal manual strata

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A METHOD FOR THE SURGICAL OBSTRUCTION OF THE FALLOPIAN TUBE

Animal Experimentation

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A comprehensive review of the subject of surgical obstruction of the fallopian tube has shown that there has been a variable but disturbing number of failures reported by various investigators. In each case of failure a communication has been re-established between the abdominal and uterine cavities. A number of explanations have been offered as to how this has been accomplished.

The more outstanding conservative methods in use today have favored the obstructing of the genital canal at some point in the fallopian tube. The Malleiner technique or some modification thereof was most frequently used. Resection of the cornua followed by some method of burying the distal tubal end into the surrounding tissues was second. Mikulicz and Dicksen each reported methods which produced stricture of the cornual end of the tube from within the uterine cavity which reduced these operations to an office procedure. More recently Power and Barnes have required the production of stricture of the salpinx by means of an electrode introduced through a laparoscope. The procedure of choice from the standpoint of simplicity and ease of performance is that of crushing and tying of a tubal segment. The latter authors have presented a method of segmental ligation of the mucous membrane layer in order to allow fibrosis in a region which has been presented to the paper.

The present investigation set forth primarily a simple modification of the Malleiner technique designed to eliminate the failure of closing the passage completely. Second, the study illustrated several probable causes of failure in the original technique.

The cornua of medium sized bitches compared favorably in structure with that of the human salpinx for these experimental purposes. The outstanding exception was the mucous membrane layer. In my opinion the endometrium in the log should have resisted procedures designed to produce stenosis to a greater degree than would the mucous membrane of the fallopian tube.

The method used in each experiment was composed of two procedures. First, each cornua was crushed by forceps in 2 areas, thereby forming a closed segment about 1.5 centimeters in length and a heavy silk ligature was tied firmly around the crushed area. Second, the lumen of the segment thus produced was injected with a sclerosing solution.

Nineteen animals divided into four groups were used. With the following exceptions the standard procedure described was performed upon each cornu. In experiments Nos. 166, 167, 171, 173, 175 the segments were tied tightly without preliminary crushing. In experiments Nos. 282 and 303 an additional cornu ligature was placed distal to the standard procedure for comparison. At the end of each experiment the entire uterus was removed and air under heavy pressure was injected into the cervix and the result was ques-



Fig. 1. Photomicrograph No. 7. Rest of the lumen of the fallopian tube. The lumen is patent and the muscularis is well developed.

tionable lipoidal was injected and x-ray pictures were made. After the specimens were fixed serial sections were made and studied. All specimens except the first 3 were sectioned longitudinally.

CRUSHING

The importance of crushing was emphasized in experiments Nos. 66, 67, 71, 173, 175. The animal represented oconsutieligations with out primary crush of the cornua. All rest blished a patent lumen. The gross appearances revealed constricted areas in which the lumen was buried. Microscopical examinations revealed

various degrees of replacement of muscle fibers by fibrous tissue in the areas of ligation and of the endometrium and a distinct lumen of the fallopian tube opposite the ligation. An example was seen in photomicrograph Figure 1. It would appear that the lumen was re-established following atrophy of the muscle layers which allowed sufficient relaxation within the ligation to permit a return of patency to the lumen. In the remaining animal represented in 561 at least instances of patency through the ligatured areas were found in 5 dogs (Nos. 304, 314, 147, 250, 330) when crushing preceded ligation. (See illustrative photomicrograph No. 314R, Fig. 2.) A study of these serial sections has led me to believe that the crushing trauma must sufficiently involve the muscular membrane to insure adequate fibrosis across the lumen.

Upon two occasions the rapid application of the forceps to produce crushing was found to tear the wall in channellike fashion as to cause a small perforation through which the sclerosing agent escaped. This accident was a probable cause of fistula in the original technique with resultant failure.

SOLUTIONS

The solutions were injected into the lumen of the segment with a No. 4 gauge needle until ballooning occurred. The tension of the solution was maintained for about 20 seconds to prevent regurgitation of the solution through the needle puncture.

Quinine hydrochloride and urethane were used to inject 4 segments (2 dogs) sodium morrhuate was used in 6 segments (3 dogs) Carnov's solu-

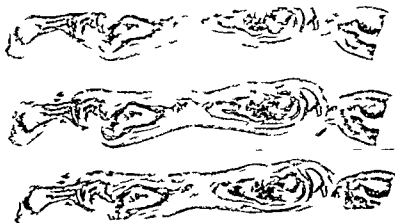


Fig. 2. Photomicrograph No. 34R. Pericystic position. Tissue destruction. The lumen is patent and the muscularis is well developed.



Fig. 3. Photomicrographs showing the degree of replacement of the endometrium by fibrous tissue (a) the degree of destruction of the endometrium (b) the degree of replacement by

fibrous tissue (c) the degree of closure of the entire lumen of the segment

fibrous tissue (c) the degree of closure of the entire lumen of the segment

Carnoy's solution produced the most extensive changes. In all 7 dogs except 1 there was total destruction of the endometrium with complete



Fig. 4. Photomicrographs showing the degree of replacement of the endometrium by fibrous tissue (a) the degree of destruction of the endometrium (b) the degree of replacement by



Fig. 3. Photomicrograph of a uterine segment showing the closure of the lumen between the sutured areas.

closure of the lumen of the entire segment by fibrous tissue (See illustrative photomicrograph No. 314R, Fig. 3). In the exception No. 324 there was complete closure at the sutured areas but areas of normal endometrium and a partial lumen could be seen. The cornua was greatly enlarged by estrus at the time of operation (Fig. 3). Examples of return of patency through the sutured areas with closure of the lumen between these areas as shown in photomicrograph No. 314R (Fig. 3).

Phenol solutions were judged a close second. The changes progressed more slowly after injection and there were 4 instances when the lumen was patent through the sutured area (Nos. 304, 47, 250, 350) although closure of the lumen within the segment was obtained in all instances. The 75 per cent solution of phenol was favored (No. 14R, Fig. 4).

Quinine hydrochloride and urethane and sodium morrhuate solutions produced only mild reactions and were considered inadequate.

RESULTS

The nature of the uterine changes following the technique of uterine closure involved external ligation of the uterine horns. In the sections of dogs No. 1, 3, and 4 the suture was found in the lumen of the segment. Several dogs passed through a period of estrus producing cystic areas or hydrosalpinx in the segments between the sutures or above them (Fig. 3).

SUMMARY

The experiment has demonstrated the following:

1. Adequate trauma must involve the mucous membrane layer in order to produce stenosis of the cornua in the dog.
2. The degree of physical trauma was difficult to gauge when induced by crushing.
3. The addition of chemical trauma produced a satisfactory result in all experiments.
4. The sclerosing solution must be adequate. Carnoy's solution and 75 per cent phenol solution were satisfactory.
5. Several causes of failure occurring in the original technique of Madlener were suggested.
6. Absorbable suture does not remain in place a sufficient length of time.
7. Simple tying without preliminary crushing does not traumatize the mucosa sufficiently.
8. Rapid crushing may cause shearing with resultant fistula formation.
9. Heavy cornual musculature which is present during pregnancy or estrus may lead to complete crushing.

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EDITORIALS

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SEPTEMBER 1945

THIOURACIL

THIOURACIL is a drug of positive action in reducing thyroid toxicity but unless carefully administered it is capable of producing disastrous complications and even fatalities. All information obtained by practical experience should therefore be made available at the earliest possible time to those now employing it or likely to employ it. So far its manufacturers have supplied the drug entirely for experimental use. Whether or not it will be put on the market for general use soon I do not know but it seems likely from information at hand that it will not be so available for at least a year.

Dr. Elmer C. Bartel, of the department of medicine of the clinic in cooperation with the surgeons in the clinic has administered thiouracil to 100 patients with severe hyperthyroidism who were being prepared for thyroid surgery and we have all watched the results with interest and profit.

Given in proper dose over a sufficient period of time thiouracil has in our hands never

failed to reduce the metabolic rate to normal. We have seen no patients in whom it was impossible to reduce the metabolic rate with thiouracil. Whether or not the remission produced by thiouracil in hyperthyroidism is temporary or permanent only time will tell. This point cannot be settled until we know how many recurrences take place when the drug is withdrawn and how long the patients in whom a remission has been produced remain in remission.

While we wait for this proof we should take advantage of the fact that in a patient very ill with hyperthyroidism thiouracil if administered over a long enough period and in proper dose will bring the metabolic rate to normal. The patient goes to operation in a nontoxic state and recovers from subtotal thyroidectomy with as little postoperative reaction as occurs in patients with nontoxic adenomas. In other words with the proper administration of thiouracil fatalities from operations on toxic patients should be eliminated, postoperative storms should disappear and multiple stage thyroid operations should not be necessary.

We have learned that thiouracil should not be given unless the patient can be seen at least every ten to fourteen days and blood examinations made against the possibility of the onset of agranulocytosis. At least fourteen deaths have been reported in the literature from agranulocytosis after administration of thiouracil.

Letters have been received from surgeons in all parts of the United States who complain bitterly that thiouracil makes the operation of subtotal thyroidectomy difficult because after it is used the gland becomes so friable that it is impossible to control bleeding adequately and

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- S L E B THALPME W d SCUD x J
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SURGICAL TECHNIQUE

- War Surg ry
- FARLEY G R Bla t I j ry t th L gs
- MARWIL T B Fun t al Am h W
- BACH H E Bl t F t es f th Lo B es
- L E L B S A t H t Fail F ll ing
Bl t I j ry
- DIC I L Th M sg m t f M lt pl I j nes
in Au w
- RO J A Rem i f Pr j til Fragm t d
Imm bl zati n f W unds
- BR R V Th H h f W und New
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d Immers Foot
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PHYSICO-CHEMICAL METHODS IN SURGERY

- R tg IGY
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- D ERSO W W Ch ra t n ti Roe tg o-
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Lymphosa c mas d R ticut m C I S oma
- M S KALLIO S Ca ci m f th Larynx and
Hypoph r ynx Roe t T eatm t d th
Results f Th py
- EKER R d Po r E Prim ry B S m

Miscellaneous

- CHY TCS J J Rad tu n Inj nes f th I t u
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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Sci II I A and Reag n D J Malignant E ph
th lm s i Orl Ah l 945 54 37

The authors discuss general considerations of the orbit to re: ympt m and p es ve vi on n primary an l in post th d ctomy mal gna t e ophthalm

Cl ic G e l a c edact its f the thyro i p o l ces th cl ical i ctur of hyperthyroid m An e c mount f thyrotrop e ho m fth t i p tary gla d sal p duc d b t it is in tu n inh t d l y th c s ive thy o in high its t mul t of th thv d has p oduced

In the stat th re is a general d edema and lymphocyte i filtrat of the o b t l content par t ularly f the xtra cular m cles

Loss f n i mal gna t exophthalmos usually f l l g thv l c t m y) ttr b ted top ss e and t i n at the p t e p p l l d m nd pen p ill ry h m r h g s ar u lly a o ciat d with d ploia d t o l m i t n o f rot t on of th eyeball espec l l i ard l d anc d ca es ar o ciat d th e l m of the ey l l s and c n j n c t i a d the p c f f m r e t r b l l a t e t o p e s by th f g r l n st i l l m e ad an d ca es the l d can be closed and k t i t l e rat and en l phthal m t m a r sult

Th f l l g f a t u e d f f t t th cl fr m th phthal m f th t i f x phth l m c g te

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I	salm tabol		H b		normal l g h l y l
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Some c s e n l c t r l l j b y thyr d t t v s d e c t d to th l s thers req surg l l c m j e fth bit In Naff g r techn q tw f talbo s p s a e m f t p o s th r b t al o o f h h m v d f b c k as the p t e f am Th n t r i m f the bit p e s d to m i t a n the co t r f t h b w th c c e s l m e s t t d

W l n 936 g g t d u t l i z i n g th f c l l b the na l i e s f r r b t al decom p e n H g g e t d r m o l o f th th m i d s u the f loo f th f ntal s and in s m ca es th m d l t r f th b t k t n r m 938 t t d p a t n t f t l i n this a Accord g t K s t ner an th authors who p e f m e d th p e r a t n 2 a c e s the h f i n t g e s of th m th d p o s e d by w l l f i r s t e d by k t a r s f l l s

Thus procedure is not only less d s i g n i n g than the Naff g p e r a t i o n but it utilizes an act al rather th n a potent al space M e o v e r in some cas s the roof f the orbit is occupi d b an e tension of a cell h c h th Naffizgr technique avoids and sub j c t i e and objective p l s t i o n (h i c h m a y f o l l o w the intracran l operation) does not occur in th p o c d e JOSHUA Z k x M D

Crawf rd R A D R p l r of Pe f rating Corneal Wound La c l Lo d 1945 48 366

A series of 33 cases in which repa r f perforati g corn al w nd v as accomplished by corn al sutures s c m p a r e d to a group in which c n j u n c t i v a l f l a p s v e r u s d No m n o r perforations v e e included and all ca es studied w r e without a retained fore gn body

Those cases in which a traumatic cataract develop ed show ed less satisfact ry end results Sulfa thiazole s u e d but no penic l l i n The c m p a r a t i e study i t h th s l p p o c c u d e show d l i t t l e d f f r n c e in the end results

Th m p o r t a n t f a c t r s in l e d a e the techn cal d f f i c u l t i e s associated w th the plac i g of the sutures as b l a n c d b y the more r p d h l i n g r e s t o r t i o n f the ant i r chamb r and the el m n a t n of infection HUNTER H ROMU E M D

C r s n L D Ocula Eff et of Altitud Flj i gland of Deep Sea D i g f c h Ophth Ch 945 33 73

Ch n g e s in at m o s p h e r i c p r e s s u r e in flying are w th n the ra g e b e t e n th p e s s e a t sea l e e l (a t m p h e r e) and that t h t m a i m m altitudes n w a t t i n a b l e by military craft (1 / 6 a t m o s p h e r) Press r e c o u n t r e d n d p s e a l i n g c a n l b exp s e d n t e r m s of p u r e s u r e t a l e l r a g i g f m i t o 6 7 o r 8 a t m o s p h e r e s

The c u l a r e f f e c t s of changes n a t m o s p h e r i c p r e s s u r e m a y o c c u r as part of a general an c s y n d o m e s a c c e d e n t s r e s u l t n g f o m l o c a l a d o b s t r u c t i o n o f r m p h e m e a d u e to d i r e c t p r e s s u r e w h c h e f f e c t s the n u t r i t i o n of th u o the i n n e r v a t i o n of th i n t i n s c o t i n s c u l a r u c l I n a m u c h s m i l t a y s l y g a t a l t i t u d a b o e 10 000 f e t e q u e s th s e of o y g e n v r d e g r e e s of n u a a u s u a l l y e n c u t e d o l y n c a s s f f a i l of th s u p p l y f o y g n l e a k a g e of m a s k s t g e t a l t i t d e s

Symptoms of an a h i c h m y p r s i t f r o m n e t s i x t y h o u r s v a r y w i t h th a l t i t d e n d t h d u r a t i o n f l i g h t T h e s e i n c l d p r i a l b l i d n e s r i g h t h o m y n o u s h m i a n o p s a b s a l b l r r g v s t g m s p o t s b e f o r e the e y e c u t i l l a t g s c o u t m a d p l o p a y e l l o w s n n d c u l a r p a n

for the treatment of this tumor it may lead to
 a more uncontrollable spread than the effect of
 it. It should be carefully controlled until it is fac-
 to methadone poisoning is controlled to the ac-
 cidents have been established.

S. M. L. J. Foc. Lso. M.D.

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SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Ehnl G and W Itman H W H miff cial Spa m
A k A P j k t Ch c 945 53 5

On the basis of 16 cases of hemifacial spasm
curr g among 663 cases of pathological movements
of the face of all sorts the following conclusions are
drawn

1 Women are more frequently afflicted than men the
ratio being about 6 to 4

2 Children do not have hemifacial spasm

3 In cephalic lesions or articular lesions with or
without hyperreflexia seldom bears a causal relation
ship to hemifacial spasm

4 The spasms usually begin in the orbicularis
oculi muscle and slowly progress to adjacent muscles
until in certain cases the entire facial musculature
is involved

5 Spontaneous remissions in the periods prior to the
years have been noted

6 The spasms almost always cease when the
causes by circumstances causing nervous fatigue
or voluntary movements of the face

7 No patient was able to stop the spasm by a
conscious effort

8 Only symptomatic treatment is of value
r so that urgent treatment of these may be
beneficial for the nervous system

9 Spontaneous facial paresis was previously
caused by the attack of facial paralysis

10 Argument is given for the view that the
causing the condition is in the facial nucleus
of the brain

BRAIN AND ITS COVERINGS CRANIAL NERVES

Hemby W B Gr Intra b l l m t m s
A k A P j k t Ch c 945 45 8 0

The present case is a bilateral pontine
lesion involving the entire brainstem and
the entire brain. Fourteen of the patients
who died of this disease died of a post-
operative pneumonia. The cause of death
was recurrent hemorrhage from a ruptured
aneurysm of the anterior communicating artery.

Seven of the cases were associated with cerebral
arterial disease (arteriosclerosis and/or hypertension)
and bacterial endocarditis and 5 with tubercular
encephalitis. The cause of death was
respiratory failure. The cause of death was
respiratory failure. The cause of death was
respiratory failure.

The present case is a bilateral pontine
lesion involving the entire brainstem and
the entire brain. The cause of death was
respiratory failure.

development of signs of increased intracranial pressure
after an acute onset of symptoms

There are cases of intracerebral hematoma arising
from aneurysms and most common near the rostral
part of the circle of Willis in the frontal lobes. They
usually manifest themselves as a subarachnoid
hemorrhage. The acute symptoms of which may
be a sudden onset of a spreading cerebral
lesion and operation for a local aneurysm
trilocular aneurysms of the hematomas of the
hemispheres usually shaggy and stained with blood
matter. The aneurysm is usually not seen.

The cases associated with tumor may be followed
by a satisfying improvement even though the tumor
itself is not removable.

The lesion as located in the frontal lobe in 4
cases the temporal lobe in 5 the occipital lobe in 3 the
cerebellum in 1 the parietal lobe in 1 and in the
ventricle in 1. Most other writers have reported
these lesions as being found predominantly in the
temporal parietal region. However there are
many reports that all of the other cases both in
fronto-parietal and in the occipital lobe.

The age of the patients in this series ranged from
thirteen to seventy-three years the average being
forty-one and eight for the years. Some writers have
been impressed by the youth of the patients
bearing these lesions.

The author was unable to reach any conclusion as
to the type of clot to be found in any particular
of these lesions. Old blood can be obtained from
almost all of them and when the clot is opened it
is always a mass of clotted material after the
hemorrhage.

Aspiration alone seldom empties any of
these lesions. If the patient grows worse the lesion
should be aspirated or opened directly. Finding
out the causality with colloidal thorium dioxide
penetration is almost impossible a later roentgenographic
check upon the progress of the lesion.

Because of the formation of scar tissue in the wall
of the cysts in epilepsy has developed both in periauricular
cases and in those surviving with intracranial
hematomas.

HEAVY A. SHEKEL MD

Dickers N W W Characteristic Roentgenographic
Changes Associated with Tuberoses of the Sclerotic
A k A P j k t Ch c 945 53 99

Two typical cases of tuberous sclerosis were com-
pletely examined to determine the location of the
characteristic areas of calcification seen in the
roentgenograms. The patients were identified with long
histories of convulsive seizures with a bac-
terial meningitis and tuberculous lesions. The characteristic
areas of calcification in the skull. Autopsies were per-
formed and none of the usual findings of tuberous
sclerosis were seen in any small white nodules
found on the surface of the brain with similar nodules
situated beneath the meninges in the cerebral ventricles.

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Tw nty two pat e ts ho p e i ly h d b e
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Two n urasthe p t nt both f whom had
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fited by the op rat n

Of 4 patients with epilepsy, 2 had a significant benefit from treatment. One of the 2 patients with a history of epilepsy was significantly benefited by treatment.

I the s h a z p h n c g r p the co d i t n w s
m c h m p r o d 7 c a e s s m e w h t m p e d

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Cohn R El t oe c phalographi Study f Pre
f nt l L bot my A St dy f Focal Brai l
J ry t h \ P y h t Ch 945 53 8;

C h n c r e d t l t c p h a l g p h c s t d
on p a t e t b e f d f t e p f o n t l l o b t m y
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c p h a l g r a m i n f c c d e t t t u m

Th imm a t b o m l l t e c p h l o g p h c
response to pr f o t a l l b t o m f c a l (f i l l)
n c n l m t y w t h t a a t m l o l l l b s u
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p l c d b y s h r t s q u e s f o p e e c o d w e s f
d u c d a m p l t d I n m o t b l t s t h l o w i n
t n s t y b o m a l t y p r s i d a a b d m n a t
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l 3 subjects h m th r l t co d gsw
m d th n e m o th ft pe at o bnorm l
e f r m s w e r cog d l d ed lobot my n
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Hyperv t lat gr thly cc tu t d th lw
f q cy ch te t es f the l ct oe ceph l
gram f l b t m d d duals b h p pera
t ly e n ntl c d by m la p c d

It is evident from this work that old cerebral lesions give rise to focal and general electroencephalographic changes and therefore the presence of prominent electroencephalographic abnormalities with lid hyperreflexes must be considered as being causally related to the cerebral damage.

On the other hand this study also shows that in the presence of known cerebral damage (acute or chronic) electroencephalographic abnormalities may be minimal or absent.

The effects of hyperventilation on the electroencephalogram after injury (lobotomy) demonstrates that neuronal disturbance is an important factor in the production of slow waves during the process of deep breathing. This clinical finding makes it necessary to partially de-emphasize the role of alteration in the blood sugar in the production of slow waves during hyperventilation.

HENRY A. SHERRER, M.D.

Meyer A.H. Meningococcal Meningitis. Report on 165 Cases. *A. Int. J.* 945:2:543.

The cases of cases of meningococcal meningitis were observed in the period from July 1942 through May 1944. One hundred and fifty cases were followed by direct smear or culture. The additional 15 cases were included because of the presence of a purulent pleural fluid and their occurrence in an epidemic period. The overall mortality rate was 3 percent for the period of 15 cases it was 4 percent.

Six of the 9 deaths occurred within the first two to four hours of hospitalization. On the other hand the remainder died in diagnosis and died thereafter after adequate treatment.

The therapy consisted of 5 gm of sodium sulfadiazine given intravenously in a liter of physiological saline solution followed by 5 gm given orally every 4 hours. A stomach tube was utilized for medication and the gastric fluid during coma. A fluid intake of at least 3 liters daily was maintained. Children were given an initial dose of sulfadiazine of 5 gm/kgm per enterally followed by oral doses calculated as follows: 5 gm per kgm. The fluid intake was maintained at 100 mgm per 100 cc of blood. Sulfadiazine was usually discontinued on the fourth day of treatment. The anti-drug action was 90 percent for meningococcal meningitis.

Meningococcal meningitis was used in cases of fulminating meningitis. The treatment consisted of 5 gm/kgm of sulfadiazine given intravenously in a liter of physiological saline solution followed by 5 gm/kgm given orally every 4 hours. A stomach tube was utilized for medication and the gastric fluid during coma. A fluid intake of at least 3 liters daily was maintained. Children were given an initial dose of sulfadiazine of 5 gm/kgm per enterally followed by oral doses calculated as follows: 5 gm per kgm. The fluid intake was maintained at 100 mgm per 100 cc of blood. Sulfadiazine was usually discontinued on the fourth day of treatment. The anti-drug action was 90 percent for meningococcal meningitis.

Repeated lumbar punctures were made to increase intracranial pressure and to facilitate drainage of cerebrospinal fluid. Intracranial pressure was maintained at 100 mm Hg. The sequence of treatment was as follows:

1. After diagnosis of meningitis in a three-year-old child the subsequent recovery of the patient was rapid in a patient with an overwhelming infection on admission who recovered (3) quadriplegia and respiratory paralysis successfully treated by means of a respirator and lumbar puncture (4) ptosis of one eyelid and unilateral optic atrophy (5) a purulent effusion into the knee joint and a purulent pleural effusion all ended in recovery without drainage (6) intellectual regression (7) a hemiplegia in a fifty-nine-year-old hypertensive patient.

HENRY A. SHERRER, M.D.

SYMPATHETIC NERVES

Stillman J.J. and Powell V.E. A Simple Technique for Outlining the Sweat Pattern. *J. of Ch.* 945:7:8.

A new technique for outlining sweat patterns is briefly described. The authors had previously de-



Fig. 1. A simple pattern with palm, dorsum, and fingers. The technique of applying the pattern is described in the text. The pattern is applied to the palm and fingers of the hand. The pattern is applied to the palm and fingers of the hand. The pattern is applied to the palm and fingers of the hand.

ll t l c l a at f th i t l l l
 R n g l
 R n g l
 f t l a n i t h b r a l f t h i
 h o t h a t t l r o n t h i c a l p l i
 i n t d t h s k u l l \ a x m a t o i f t h t d
 b a e c e d t h n e t h c a f h a e a s f
 n e a r s d e n s t i t h s k l l h e x m i n e d h
 l o g c a l l y b d h y p r t f t h e r t a b l and
 f t h e t r a b e c u l a e f t h e d p l o s p a c e s T h e c a l
 v a r i u m a a l s f u d t b e o f d m n h d t h c k n e s
 M a n y f t h i s l n d s o f h p e r o t i n t h e k l l o e
 l a y t b r u s n d u l t h e c b l o t
 A n A M D

II f s t a t t L S m l i k E A n d B c h k P r
 f o n t l L o b o t o m y i n T r e t m n t o f C h i
 P s y h o s w t h S p e c I R f e n t S e c t i n f
 t h O r b i t l A r e a O n l y A h \ P j h a t
 C h 94 53

T h u t h r s d c e d t l n t t h p r a t n o p
 f o t a l l o b o t o m y t s e c t i o n f t h b l e g o n n l y
 o f t h e l e q u d a n t s o f t h e f r t a l l b e T h i s
 a d o n i t h t h o p t h t t o u l d p r t b e
 f l e c t v t a t m e n t a l l o c t r i c t h t t f d e
 t r u c t u r n n d p t p r a t s q e l a A b u r h l
 s p l a c e d 5 c m b t h e v g o m a t i a c h d 3 c m
 p s t e r o t o t h e l a t r i m f t h o r b i t T h t o p
 o f t h e v n t i c l w a s l c a t d a n d a u t m a d n t h
 r o n a l p l a c e t o t h d p t h f 5 c m i n f r n t f t h t i p
 f t h e v e n t i c l e f r m t h e l l f t h e b u r h o l e d n
 d T h u p e d u w a c a r e d o u t b i l t e r a l l y

T w o t y t w o p a t n t s h o p r v o u s l y h a d b n
 j d g a s h a v i n g a r y p o o r p o n o s r e u b
 j t e d t t h i s m o d i f i e d p r o d u c e A l l h a e b e n
 f l l e d p f r a p r o d f t w l m o t h l g r
 a f t r o p a t n T h d i t o a o s d r d
 m u c h m p d w h e n t h e p t e t c u l d e s m h s
 c l a t t u s a n d r t r n t h s f o r m l v e l f
 o c u p t o n I t a c o n s d r d a s m p d w h e n
 t h p t n t w a s b l e t m k a b t t s t i t u t i a l
 a d j u t m t a d s l i g h t l y m p r e d w h e n h b
 c m a l e s t r u b l e s m e u r s n r e u s t d l p b l e m
 T h e p t n t s u f f i c i e n t f m a f f e t r e a t n
 t p s o f p s y c h o s a n d w h p r o s l y h a d h a d a
 e r a g e o f 12 m e t r a z l o c l c t r c s h o c k t r t m e n t s
 r o p e a t e d p o n T w o f t h e s e b t h g t a t e d
 p e s e d i r d u d u l s w r e g r e a t l y b n e n t e d T h
 t h r d p a t i e n t w h h a d b n n a c h r o n m a n s t t
 w a s b e n e f i t e d u f f i c i e n t l y b t u r n d t o h f m l v

O p e a t n t w t h a b s s e c m p l i v e c u o s i s
 w h o h d p e v i l y n o t r p d e d t 7 m e t a l o r
 l t r i s h c k t r m n t a e a t l y b e f i t d

T o n u r a s t h e c p a t i n t s b t h f w h o m h a d
 b e n t e a t e d u n u c c s f u l l y t h l n d m t r z l
 r l e c t i s h c k p r e o p a t l y w r e g e t i v b
 f i t d b y t h o p a t n

O f 4 p a t n t s w t h e p i l p s y a n d p s y c h o a l l f
 w h o m w e r e p e r a t e d p o r a g r e a t l y b f i t d
 n d 3 w o n l y s l i g h t l y b n e f i t e d b t h p d e

I n t h s c h i z p h g r u p t h c n d t n w a s
 m u c h m p r d 7 s e s m e w h a t m p e d

4 a l s l h t l y i m p r l t i j v q
 l l l l r p a t t s h l t h l t a t f
 h l t h i a a l g r p h i t h b h
 t r t f r e j n s t p e a t
 N l a t h i f c t n s r p l p t c s e u h e
 u l t l f t h p r o c d u c e t o d t T a n i t r y
 t e c d v l p l i 4 o f t h 2 p a t i s h m
 o l y t h e l o r q u a d r n t s r s c t i o n e l a s o p p o d
 t 4 f 8 p t e t s i w h o m l l a q a d r t s e e s e
 t e d l p a t n t s h a d m l d t r a n s t r y h m
 i r s d i n o t h e r s t h e w s m a k e d t
 f c t h s p c h b u t t h a l s a s t a t o r y
 l s t p a t e c o n f o a n d d s r n t a t o w e n
 f r i e t l y o b v e r e d n d h a d n e f f e c t o n t h o t
 c m A c t e s a d e p n i e n s o n t h e f r s t
 p t p r a t c d a y d i d n o t a f f t h v e r s i l u t
 c m o f t h e p e a t n I m p o e m e t o c c u r r e d
 w t h n a i v e c k s o r a f t e r s l o n a s a y r
 I n s m m r y a p t p a t i e c o r y r a t l 4
 p e r c e n t w a b a d a r e s l t c m p a g l v a b l
 i t h t h e r a g e r a t e o f r e c o v e r y o f 3 t 3 p e c t o f
 7 o t h r c l i n i c s T h i n c i d e n c e o f t r a n s t r y p t
 p a t i e u n a r y c o t n c e a m u c h l
 p o t p a t e d l l g d l o w g u p c l p r o
 n c d w t h t h s m d i e d p e a t l t a c
 l u d d t h t a s a t s a t o r y t h r a p e u t c r l t i n p a
 t e n t s w t h m e n t l d r d e r a b t e d t h c
 t o o t h b a l s u r f c a l o n d n a t h a t b t l
 a e s o f t h e f t a l l b e s h a a r o l n r g l t u
 o f t h e m t i o n H K A S E M M D

C o h n R E l e c t o e n p h l g r a p h i c S t d v f f r
 f r o n t a l L o b o t o m y A S t u d y o f F o c a l B r l
 l r y A h \ P j h a t C h u 94 53 33

C h c a r e d o t l t e n c j h a l g r a p h i c t d o s
 n p t i s b l r d i t r p e f o t l l b o t u r
 r d t d t m n t h l e f e c e b r l d a m a g
 a n d h w t h u s d n m y h l p t o t r p r t l e t o
 e n c e p h l g r m s n c a s f a c d n t a l t m a

T h i m m d a t e b o m a l l t e n p h a l o g r a p h
 e s p o n s t o p e f o t a l l b t m v f c a l f o n t l
 n c o n f r m t y w t h t h a t o m c l o n i n a l l b
 j c t s f r m h m e c o d g s t a k e n w t h a t a
 d j s f t e p e r t n h g h o l t g s l w w a s e c
 o b s r v d i n t h y m m t i c a l f r n t a l a d W t h
 e t o t h e m o t h s a f t e r p e r t i n t h p o m i n t
 l f e q e n e s (t o 4 p e r c e n t) w e r e
 p l e d b y h r t q u n s i f 6 p e s e o n d w a v e s o f
 r e d c d a m p l i t u d I n m t s b y t s t h l w n
 t n s t y b n o r m a l i t y p e r s i s t e d a s a s u b d o m n a n t
 c h r a t e t i c l g a c o r d s r e m a d e

I n 33 b j e t s i n w h m t h e r l t c o r d i n g s w r e
 m a d w t h n o n e m t h f t e p e r t o n b m a l
 w f r m s w e r e c g u s e d I n d l o b o t o m y i n
 d c d t h e r p l a c m n t f p e p e t c h g h f
 q n e v w a s e s b y n o r m l a p p e a r i g l p h a e s
 R r e o n t o t h e p o p e a t e c t r l r c d o c
 c u r d n m t h l a t e

I l p e r v e t a t g t l y c e e t a t e d t h l o w
 f q c y c h r a c t t e s o f t h e e l e c t r o c e p h a l
 g r a m f l o b o t o m d a n d v d u a l w h p e o v e r
 t e l y e e n i l c d b y a s i m l a p r c d

cib d a m thod for showing the sw at patt rn in
the banl and the new m thod is an adaptat n of
thus one wh h is suitabl for u e over th re t f the
body Th only chem cal used are alcoh l t nn c
ac d and ferr c hlo ide The ferr hlr d d
lutd with thr e parts of alcohol and appli d to th
limb th a c tton t pped appli cator Th s evapo-
rates rapidly a d l e s a dry uria estained h tly
w th ferric hlo ide An tomiz r then s d to
pr y taun c cid p d r o e the area As th
s eat gl d fu ction the r a sweat n b c m
diffu sly blackened AD IE VER C HE MD

MISCELLANEOUS

Lew y F H What I th G ll n Barré Syn
d om ? J P d l S L 945 6 65

The author points out the confusion which exists in the classification of certain polyneuritic polyneuropathies and sensory paralyzes of radicular or plexal nature. The recent tendency has been to include all of these conditions under the so called Guillain Barre syndrome.

Two case histories reported of the Gullain Baré syndrome described as all the histopathological findings. Autopsy was done on a child who died unexpectedly in the fourth week of the disease from a late degeneration of the phrenic nerve.

A comparison of the sacral nerve roots in these 2 cases was made possible by percutaneous exposure of

the sacral roots: the second case which re-
sulted in adherent nerve roots from which sections
were removed.

Pathologically, peracute radiculopathy of almost
necrotic nature was found. The myelin was pal-
rized. In many instances was found to be
completely disorganized while the axons were
fragmented.

Further extension of ment as demonstrated in the child at autopsy as the phrenic nerves showed signs of acute irritation evident on the basis of histological data. The general necrosis in the anterior horns and degeneration in the white matter of the spinal cord all of the evidence had failed to produce clinical signs.

The oögonal concentration of the *Gullian-Bret* yolk was described as a result of the polyneuropathy with peripheral neuropathy of the motor nerves of the albumin-cytological detection of the spinal fluid.

It was pointed out by Mr. [redacted] that in 1937 G. [redacted] himself [redacted] this [redacted] without a [redacted] [redacted] [redacted] [redacted]

The sug st n s made that the des nat on
Gu ll n Barre syndr me ber t ned as g r l
he d n the v u forms of polyn urop th y and
ad culopathy f u kn n t olov w th or w t st
e croachme t po th c ntral nervous system: a d
a part l blo k as d cat d by the album nocyto-
lo cal d soci t the spr al fl d

HO AR A B OWN MD

SURGERY OF THE THORAX

CHEST WALL AND BREAST

B 1 g R E Samu ls L T and McCa tney J S
Th T eatm nt of Pubert l Bil teral Gynec
m stia S g y 945 7 397

The authors report a case of bilateral gynecomastia developing at puberty in a sixteen year old boy. It was associated with little or no endocrine treatment and some evidence of improved renal tubular function. The 17 ketosteroid output was low. Administration of testosterone daily for three weeks decreased the volume of the breasts by about 50 percent while the body weight increased. The excretion of 17 ketosteroids was also increased. The change in the gland appeared to be decreasing with time however a surgical removal is sort of

The histological picture is that of chronic fibrinous mastitis. The case appears to have been another of the syndrome described by Kleinfelter, Rosenfeld, and Albright.

While considerable reduction in the size of the breasts can be produced in these cases by intensive treatment with testosterone the result is not nearly satisfactory probably because of the increased endocrinal connection to the breasts. The surgical approach to be preferred androgen therapy can be used satisfactorily in these males.

CARL O. L. IV M.D.

Bladd A G Imp ed B e st Lifting Ope ti n
Am J S g 945 67 488

The author perfi m his breast lifting per ti
u d r nerv block anc th s a d local infiltr ti n
abo t the n pple f ne s ry The w l cat on of
the n ppl i m rked by m a s f a triangle wh h
pl c s th ppl s q i ches apa t and n th th d
c s l nt rspace The first st p n the per t n i
t c t ac cl ar u d the a e l a th n ppl s a
cent Th do e by mea s f l c t cal cut
t g po nt plac d a compa s f the author wn
les g A rtic l n o i m d f m the low
bed f the c s s down to the h t W The
k n i n t d u d f om th ent u f f the
b c t ca e b e c e d not to p tu th sk n
d t f l ow th l e of lea e W th sk
ha be n sep r t d compl tly n l l d r c t n th
Lah y ite clamp ar s d t b l d th gla d
v e t lly The fat s the r mo d f m th be a t
whe t h br a t t s s u is g atly r s i z d k y
t s e h p e d s c t u i x is d f m th uppe cen
t a l p n t n Othe ect n s a e r m d f n c e
y The gl d s s u t u e d t s p p r p o s t i o
d th k i n f s h o u l d e d

Th fin l step is to bri th n pple t th rf c
ts location The l ct l c tt g poi t a d
mp re ga s d A p n g l ghtly la g
th th rg l reolar i m d Th lo

ple is sutured in place with five silk sutures. A pressure dressing is then applied.

EARL O. LATTNER M.D.

L m n t E S Pl stic Surgery in R con tructing
 Enlarg d Br st S g y 945 7 3 9

The author uses the types of procedure for mastopexy according to the individual case. The one-stage mastopexy with transposition of the nipple may be used in the majority of patients with enlarged hypertrophied breasts. The incisions are carefully measured and marked the day prior to operation. The initial incision is circular around the areola. From the center of the skin incision on another is made perpendicularly upward to the new nipple site. The skin of the breast is undermined in a thick flap in the plane of cleavage. The breast entirely freed of skin with its nipple and areola attached is pulled up to the desired position on the chest. Wedges of breast tissue are removed until the desired size is obtained. Following reconstruction of the breast the heavy silk sutures are taken though the pectoral fascia over the second rib carried through the upper poles of the breast. Thus the breast is secured in its new position. A circular button of skin previously made to serve as the new location of the areola and nipple is removed. The excess skin is removed from the skin flaps and the skin dog-eared approximated. In reconstructing the opposite breast a scar is excised to create symmetry and similarity between the two breasts.

In m ledly enl rg d br t t o tage op a
t on ith n ppl tr pl ntat on may b the method
of ho In s ch a t the ci cul a ca hich is to
be the ec pi nt bed for th n ppl tran plant s ca
flly measured nd m rked An inci s made
thr gh p rt of the derma and th skin is di sected
f s to l a bed for th r c ptio f the nipple and
t s e la An incis on is made ar und the a c la
f ll i g a pr usly ma k d cicle and the truc
tur is dissect d free alm t as a f ll th clness g aft
Th n ppl a d reola a e transplant d to th n w
it nd a su table press dre s ng is appl ed Two
ks l t the s cond stage i ca r d out An in
ci on is ca red d wn f om th c nter of the trans
plant d n ppl a oth inci n is made al g the
nder urface f the br ast Tw thick kn flaps
cre ted Th r q uired am unt of breast tissue
eected in the form of tria gula w dges The
kn flaps re sh ped and ppr x inst d in the form
f an x rted T

Incessantly large breasts that have hypertrophied and retained an abundance of fatty tissue, two-stage mastopexy with transposition of the nipples carries out an incision in a double-doughnut shape, the design must be made all around the breast to transfer from the chest to the new



b



d

Fig. Illustrates the modification of the breast tissue. The first drawing shows the breast tissue with a large, irregular incision. The second drawing shows the breast tissue with a large, irregular incision. The third drawing shows the breast tissue with a large, irregular incision.

The first drawing shows the breast tissue with a large, irregular incision. The second drawing shows the breast tissue with a large, irregular incision. The third drawing shows the breast tissue with a large, irregular incision.

cess of kin fr m th apr n il p remov d and the edges ar sutu el \ Penrose d ain i nse ted high nto ither corner of the ound T o weeks later th previous line f inci on long the infra mammary line is opened and f om its center dge n incus n i made p a d th cent r edge of the are l to form an in ert d T T o thick t angular flaps are cr ated to expose th medial and lat ral poles of the brea t T o three triangula v dges f b east are remo ed a d f necessary a sem ci cular section is mo d along the inf ramamm ry reg n Th r q red mount of kin is rem ved b th from th c nt r f ach flap a d f om its n fer o port n A Pen se drain is placed in ach angle f the wound F LO LATIMER M D

TRACHEA LUNGS AND PLEURA

II yw rd J I The R m val of Blood fr m Trau m ti Hem th races A i l \ 2 l nd J S g 945 4 57

The a thor d cusse the m nag m nt of ca es of traumatic hemothorax in the Ne Guin a battl fr t Th is st ll some contro ersy as to wh th r or not tenil hemothor cess sho ld be aspirated The a th r b le es that the a guments against asp a t such as the int d cti n of infection on th e st tng f fresh h mo hage nd the splati g eff ct f the blood on the lace ated lu g have been refut d

Bl od m y clot n the pl url cavty in o s ways d to d ffe nt d gres varyng from ho t th ad f f b m t a larg coagul m f fibrin The fl d c nents of diff re t locul may va y i col r and c nsistency The clotng vari s from c se t case nd it is bvio s that a number off ctors at play Thea thor b l es that the facto f infect on is a important one

Blood may b rem ved f om the pleu al cavity by various m thod ch as aspiration i te costal tube dra nag and by rib esectio a d closed lrai ag The ca es in New Gu ne e treated by repe ted aspirat n with a replacement A rule n t more th n pit f blood was remo d t a time and the p c w r peat d i thre d vs A thes ca es w tr tied up to rd the f nt t as ften neces ary t subjct th m t a pr aton n th way t th base hospital

FORREST D DO RILL, M D

Th m C P nd Cl el nd W P Dec rticati n In Cl tted d Infectd II m th ra s La t Lo d 945 48 37

II m th by f th comm est c mpl ca t i che t j nes f r t m v be ass c ted th ny f th r s types of injury pr d c d by bla t ru b g nald t nt pe etrat g and p f rat ing w l

O e m t d f f t t b t een a m l h mo th ra wh ch the m the most import t f f f an ny r d th c mpo nd o c m l c t d h m thorax wh h th pl ral blood s ci ated th a m e i us mpo t t jury t th lu g

d a phragm or chest wall Alm t ll f th latt r type of cases require acti e su gical tre tment Th associated hemoth rax if remo ed at the t m of operation rarely causes further serious touble The mple hemothorax presents rather a differ nt problem for with adequate treatment it v ill usu lly r l e apidl and completely How er th mor tal ty and morbidity in these cases depend almo t entirely on the occu rence of infection or mas clotting in the hemoth r x

The xtens e ntraple ral use of penicillin has un fo tunat ly been asciated th a tendency to dis gard the p nciples of early nd frequent aspir a tion f blo d from the pleural cavity so that m ny cases ema n virtually unaspirated for a cons derable period

Tvo fai ly distinct types of clotted hemoth x have been ncountered On shos roentgenol gi cally mult pl pockets ntain ng air and fluid sep rated by trans ba d or sheets f fibrin The pockets a e often sh t f f r m ach other nd th r c nt nts m y vary from st ril ser u fluid to frank p The sec nd a ty ncou tered is the ma i e clot In th s type the clot s usually in one piece or relati ely small number of piec s sometimes gh ng as much as a po nd

The d ffe nt appear nces f the t o types a c due t the p esenc of air in th pleural cavity in the ly tages S chair may have com from the lung r thro gh the ound o it may ha e been i t duc d i t nti nally d r ng a i replacem nt It is u l k ly that gas p duc d by a aerob c o ganism can h liv acco nt f r the diff rences as many mul t l cul ca es a ste l while infect on f a mas i e l c t ith ga f r m ng o gami m gi e ris to a sp gel ke appearance roentgenol gically Gas fo ming org n m s undoubtedly acce t ate the ap pe anance of the multilocular variety

Th phys cal signs of the clotted hemothorax are essent ally thos f pl url fl d In the multil lar case r a f tympany and dullne s may alternate B eath sou ds a e us lly b ent but somet m th y are present a d then ar bronchial in har cter f h occur enc f br nchu l breath s unds d p nds n the st t of the und rly g lung th y are most s lly heard wh n the lung i at c t c

Th ro ntgenol g cal features a sometimes d s t nct c b t are commonly th same as n any pleu ral eff sion In the multilocular cases the app ar nce f mult ple fluid l els is character stic but the cond t on m v s mul te th shadows thr wn by the l me tary t act so th t a d a phragm tic hernia m y b su pe t d Lat r ca es w th massi e clot tng h w a h ply d fne l opacity s rganizat n and c ntraction p c d and sm ll cl s may s um an o al ph cal shape r embli ng a che t all t m r or a periph l g th f the l ng

Th final d g i of cl t th g d p nd n the g nabil ty to a j irate blood n r aso ble q tit es w th an asp rat g needle Small qu nties of blood can be aspirated e en wh n a mas ve cl t i present because a little fl d blood is sh t off n l

cul in the l t T o often the a pirat n of t v r
thr eoun es ffl d bl od ha l d to the us less con
t nuanc f con rative t me twithunfo tunat
delay n the mplo me t f mo e acti m a ures
The inability to a prate bl od from a hemothora
does n t al avs m an that cl t ng ha occurred—
th a pirat n s t may be too lo because allo
ance ha not b en made f r th usual i e in th
d phragm after injuri too small a e dl may b
empl jed o the needl may b repe t dl blocked
b sm ll fibr s tag fl t ng n the flu d

Much bl od can unq est n bly be abs rbed from
the ple ral cav t but en in m n mal cases the e s
a certa n amount of o uzat n abd hb o s t s e
f rm t on In the cas f la g r c llect o s c nsid
e abl hb ust ue fo mati n curs ths may
f rm a r i tant c r t oft n an inch o m re thick
a o nd th lun and b tw en th and the chest wall
t pr duce a cond t n s itly termed the fro en
ch t O g n z at on w th fibro s tssu format on
oc ur with great r p d ty n a hemothora and
appa ntly takes place earl e and mor t n e
n clotted ca es

E l nd complete bluter t n f th pleur l
p e is th m t mpo tant sngle fact n th pre
nti n f pl ual ep s and its elim nat n when
e estab l h d

Ea l r m th d f treati g clott d hem th races
attended by incomple t or cons derably de
l v d lu g xpan ion At the best uch methods led
to c n d able deformity f th chest which in late
lif caused vere pur tory embarrass ment Less
fortunat pat ents were left ith se ere and p o
l ng d ple r l inf cti n hch as la gly r sp n
ble f r the mortal ty at the base h pital

The empl yment of decortication with s ction
dr image f lfl the bas c p i couple fearly a d c m
pl t r xpans on f the lu g The authors fe l c
ta n that the meth d will redu markedly both the
mortality and th m b d ty of ths g o p f cases

An inte costal post rolatel app h thro gh
the s th sp c w th rese tion of a segment of the
s i th rib poste ly is empl ved fo all but the
sm ll local e d ca e In th latter g o p the inc
s n is plac d r the affected rea Good wide
ac ess is e sent l if the ap cal and diaphragmat
regions are t b rached astly Blo d and lot ar
first rem ed from th ple r l cavity The lu g i
then found enca d in a d m oth membran th
l t l o n p i tory e cursi n This m mb an
ca f lly n d unt l the gray sh nun lay of
isc al plur is e c nte d A plan f cl ge
ead ly f und betw the pl u a and the fib us
coat and the l tte is ca f lly em d f m the
l ng b bl nt d ct on w th the finger or la g
uried hem tat e th r clo d r with a mall swab
n ts ga C e mu t be tak n t a id lac rating
the pl ur b t a numb f small t ars seem
v od ble It i d is ble to try t m e the
co t n f m th l ng mm d atel adjacent t a
lu g o nd wh th b al ed or u heal d fort do o
m r ly es It n consider bl pulm nary lacerat n

All i c at n of th pl u a ther traum t
operati e huch till perm t the l ak e of mth
con l on f the decortication sh uld be t rrd
with fine catgut If the daphragm is cov e d ha
fibr u t sue coat ths co t should b rem d
the cost ph nu sin s refo m d b b eak i g d a
the bl te at ng ad ons Th fibrous coat ge
th ps i tal pl u a shoul then b r mo d a co
pl t l v as po s bl Ths s often d fficult task
pu ely mech nical a on

Int rcostal dra n g tubes ar o m t d l u
th ap cal and ba al reg n of th pl ual ca t
The ap cal tube is insert d th o gh the highest a
abl intercostal pac bet c n th v rtebral bor t
of th scapula and th v tebr l column whil th
ba l tube (med um b re t a ht tub w th a s le
h l) is se ted at th bangl bout i ch f m
the l e lim t of th pleu al ca ty The thorac t
om wo id is th n clo ed in lay rs

D n g and aft the ope att u t fu n f
hole blood i mployed f m z to 3 piats of bl m
ar usual n ces ary b caus hock may be se
the patients a e oft n poor op ati e risks and h m
rrhage may b s gnificant but i rarely s i e

P ntothal w th cyclop pane nd o ygen ge a
b v th clo ed po it e pres u e ntrat h al method
has b en u d n mo t cases Wh n the fist las ha
b n l rge nit o s o ide oxigen a d ether ha e
plac d the cy lop opane

In th first plac nd fo as b ng as dem n trabl
bronchopul ual fistul are present b th t b a e
onn cted to w te ealed bottle When the fist
l s h v l sed—u ually betw en t live a d thirty
six h urs afte op r t on—b th t bes are on cted
by a Y shaped conn ti n to a el c t i s t
pump The pres u e d c d as ap dly as ca b
l rated to 50 c m Hg In no cas sho lds ct
be st rted unt l th pat i t propped up o p llo
afte the ope ation If sucti n is start d when th
pat nt is h riz nt l th re danger th t the uppe
lob may seal the pper cath ter and th v n nt
rior p cket f air sh t off om the tub S ct on
mai tained f two o thr d y nd wh n the l ng
is fully expanded th tub ar r mo ed p ca ti n
h l d b tak n to e that no a r k al n th
tube tra ks afte emo l f the t bes

Hem th ac ccu r d in 5 6 (70 per c t) f the
ca es in a res of 750 heat j t Infect n was
pr nt in 30 per c nt and cl t n 9 pe c t f
the hemoth r c s Jo e n k NAR MD

F arnly G R Bl t Inj ry t th L g Brit
M J 945 474

F p ment l t die ha e l d that th path
l v d e t vpos bla t on the lu gs m n
fest d b pulm ary h m rrhage of ry g d gres
of s r t v f om mall cap l l ry s rfac bl d g t
omplete hepati t on f th i ng These les o s
em t be ca ed by th force of p i t e p e s a
d i c tly on the he t w ll

Th p es nt epo t tain d cl nical analys i
such ca es c ed at a base hosp tal f om t to

TABLE I—SUMMARY OF CASES

Case	E t so ce por	T m sci	P	Co gh	H mo ys	Signs h	% fond gvi h
1	Atrial bomb y ds P on		d l os	days	h days mu	N l d 5th 7 h t days	N l d 6 h b s b d y
2	M bomb 3 f Fac ng	8 h rs	5 d ys re ros r n d y bd m	d ys blood	h days interm	G l h bu 3 d d ys	N l d 3 d h h h day
3	Atrial bomb y ds F		5 da ros r n l	8 days m d pu tum	d h d m t	C nos hype pa dg l h h da ml d da la	N l d 6 h b d ys
4	Lan f mu ds Lef d	5 m us	d ys righ bes	days m d pu um	b-p h days d l	N l 3rd, 5 b p h days	N l 4 b 7th d vs
5	La d m lov S pu		6 days os r n l d b k	5 d ys blood pu m	5 h d ys	N l d, h, 7 h days	N l 6 h b days
6	f ta bomb y ds F	5 h rs	d wh l he	5 ds blood	-5 h d ys d l	G alized h h da ml 3 d 5 h 7 h days	N l 3 d 8 h ds
7	M bomb ?	h	7 da h l hes l f rm	3 d ys blood	d d d	Ge alized h h da l 3 d 5 h b days	N l 3 d 5 b da
8	M rta bomb y d	5 h rs	3 days ppe b- d m l f b k	3 da dry	3 d d	N l 4 h 6 h d	N l 4 h d
	Gre ad 3 y ds Ri k l	F mu	5 d wh h	3 days fro hy pu um	d y	N l 4 b 6 h days	N l 4 h d
	G d Lef d	Sh m	7 d ys l f h l m	7 da m old pu m	4th d vs	Ge alized h h t d y	N l da h lob fl d 3 d d
	M bomb? R h l		8 d y l f b	da blood p m	da f 6 hours	N l 4 h d ys	Inc ased d y l f l so 4 h d y
	A l b rth y rd P		4 d ys l f h	5 day m d m	da	Cy os h db th gn h h d y da ml	Opa b b h mu fzo h d 18 h d
3	A l bomb? Back	F m	d ys os l	d blood	d	G baed h h da dull es d dimu hed BS l f bas 5 h d	O l f l d pa l ug 8 h
4	A l bomb ?	7 h rs	d vs h bes	d	d	D ll ss d d m n h d BS h base da dim n h d BS d ps righ base 3 h da	H vy p h l so mallopaci l l mud so 3 d d y l rin gh l f 3 l 6 h d l h d
5	Fl bomb		days h l h	Ch b h		Lef h mo h 3 d da as d	Lef hem h ra f b 4 h d
6	Sh l d B k		5 d l f h	d ys dry	d	Lef h m h d d y nsol da so l f b h d l 3 d d	Lef h m h d day pl lth k n g d da
	M rta bomb l lue rench	Few m ns	7 da l f hes	3 d ys d		N l d d dull es l f t base h da	N l 3 d da paci l f b h da lmos lea h
8	Fl ng b b B k		d ys re ros r n l f b k	3 d dry		N l d d days, dull dim n h d BS d ps gh base 3 d d ml 4 h d	N l d 4 h d y
	M rta bomb 3 rd Le d	h	d l f hes			N l d y, d ll es d dim n h d BS l f base 3 d d ml 5th d	Op l f base 3 d da lea d 8 h da
20	Atrial bo b F	6 h rs	4 d ys l f hes la k dum			Ge lized b h da consol da righ b se th da esolvi sol d so l f base t 4 h da	Lit l midso paci es h > 1 4 h day opa i y l f b se 4 h d
	M bo b d Crou king		days pe b k			Cy nous, sea red reps bo h l d ys d fl ess d dim hed BS l f base h	T ased d l f lo so pth d y l th d

urteendysftoundgThocfijv
 rehendgren ds mortr bombs l dm
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 mu cles f the ppe abdomen or tho e f the back
 All b t a pati nts uffer d f om a f thy c gh
 H m pty s ocu d n thr f rth of the ca es
 and h dan in ers el t nshup f the symptom
 t th in dnce f ma ch m rh g as sho n by
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 o es nd er cent lly placed Ther wa n c r
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 mo nt f p l m nary damage as r eal d by the
 ray Th t eatm t f bl st in j ry f the l g
 wa sympt mat c Th us of sulfo amid p
 nted pne m

P J MEN G P S AF MD

Fillbury N R d Wa rs g J D Th D f
 f nti t i n of B nchiog m C clinom nd
 Pulm n ry Tub culo i V E gl d J Jf 945
 3 76

Because of th ma y l cala d r ntg n log cal
 mularities of b o h i c ca ci ma nd pul
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 mitted t a tub cul s s h p tal a e p ese t d by
 th auth

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 n of t b cul is ha al dy bee mad S c
 the clinical findngs m be m lead g l m t
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 t m y

B o chi ge ca c oma must b p omptly d f
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 ne cue malign t go th W t g w ks
 or l g f es l t fa u m l cul to tests
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 f rg cl r

A rly d gn f b h n c m a
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g In all cases in which th racic symptom re
 p es nt x rav xam nati n f the chest sh ult be
 made imm d at ly If o th b s s of phys cal l
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 the prese e or b n f e d br nch al t b cu
 los m yalt th pl n f c ll p se therap lle ce
 n th r d s s m ch may be g i ed by p ompt
 br nchoscopy m nati

In the authors s es all th p tie ts e e me
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J K N MD

Holl g P H Hara H J nd Hirsch E F
 B n h g n l c a In m An A ly l f 175
 Pro d Ca s A O l R h l 945 54 5

The a th rs pres t comp eh n e t dy f t
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In order to identify the symptom in the res-
cued child suspect of tuberculosis the
pneumonia and lymphatic system
stages. The genetic changes in the ex-
treme stages of the disease and group of
findings can be considered pathogenic or
rare variation must be considered to be the most
accurate of the procedure which lead to a presum-
ptive diagnosis of the disease.

Bronchoscopic biopsy should be done in all patients with obstructive pulmonary pathology in the hope of firm diagnosis. Thus procedure has been successful in approximately 80 per cent of the cases.

In the series of cases reported sq am. cell carcinoma was the predominating type and comprised 64 per cent of all the carcinomas. Small round cell carcinoma; 17 per cent; anaplastic; 13 per cent; and adn carcinoma; 6 per cent.

The treatment is primarily surgical although the method of treatment at some times used is a surgical diathermy and the direct implantation of adrenalectomy and into the tumor. These methods are not suggested as a final case control.

JOHN F. DELPH, M.D.

HEART AND PERICARDIUM

B tch lo T M nd M n M E Congenit
Glycog f Tum rs f th Heat f h P sh
Ch 045 39 67

Cong n l t m r s f t h e h t (h a b d o m y o m a
r c m p a t e l y r a e S n n R c k l g h a s e
describ the first c a e i n 862 62 u t h t c a e
have been c d d The card ac t m o r s were cer
ch fly i n f a t s n d t h e p b n w i t h 52 p e c n
f the pat e n t s d y n g n t h e f i r s t y a r f i l l n d 86
p e r c e n t b e f r e t h r c h d o b t v

Glycogen tumors of the heart rarely cause clinical symptoms except in those patients in whom the tumors are situated in the aorta. In fact, the etiology of the cataplexy may be hereditary. Convulsions were frequent symptoms in the cases reviewed. Especially in the newborn infants and in those patients who died suddenly, Sneath's sclerososis was associated with the congenital cardiac tumor in 50 percent of the cases. One would expect symptoms of a neurologic nature in such symptoms to occur. In children and infants the mental development was retarded and the ability to talk delayed. Some of the patients exhibited marked intelligence and reasoning. In some of the patients epileptiform attacks frequently manifested themselves in the form of seizures. In the most recent patients, seizures were sudden and of the tonic-clonic type. In some cases, the diagnosis was based on the following

The error reported by the authors is the
 an American literature. In a case of multiple
 general medical literature. In a case of multiple
 tumors of the head in a three-day-old boy glyc
 as in that of the tumor cell.

These results suggest that the tumour congenital
liver glycogen accumulation is of the hepatocellular
type congenital rhodopsinoma until more
known about the nature of the lesion.

Strauss R and Morris R Primary Tumors of the
Heart 4th Path Chc 945 39 74

Reports of primary tumor of the heart appear infrequently in the literature. Because of the reluctance of students of the subject to accept the diagnosis in some of these reports, there has been a considerable variation in the estimate of the number of cases that have occurred. The number varying with the bias of the author. Apparently only 163 cases have been reported to date. In a dual percentage varies considerably as among 30,000 utopians, no cases have been successfully reported whereas other workers have reported 3 cases of primary cardiac tumor among 200 autopsies.

The site of the tumor may be in practically any part of the heart but the tumor is found less frequently on a valve and most commonly in an atrium. Apparently it may be either single or multiple. It is graded that in all cases of tumor of the heart the neoplasm is of mesoblastic origin and therefore it has been reported as a myxoma, fibroma, lipoma, lymphangioendothelioma, hemangiopericytoma, leiomyoma, rhabdomyosarcoma, leiomyosarcoma, fibrosarcoma, polyps, chondrosarcoma. According to the literature the disease occurs equally among males and females. The young age group is chiefly affected but ages have ranged from ten months to twenty years.

As a rule the most frequent diagnosis is cardiac. In patients with a history of primary cancer elsewhere a detailed physical examination of the heart and a complete blood count are necessary. In the majority of cases the diagnosis is made by the physical examination and the chest x-ray. In some cases the diagnosis is made by the electrocardiogram and the chest x-ray. In a few cases the diagnosis is made by the physical examination and the chest x-ray. In a few cases the diagnosis is made by the physical examination and the chest x-ray.

Whether or not primary tumor of the heart can be diagnosed prior to death will depend certainly on its ability to produce symptoms by interfering with the cardiac mechanism. A small slightly enlarged tumor of each member of the heart and in some cases a large one in one of the ventricles would not be physiologically apparent. A tumor on a relatively sufficiently large could be expected to produce murmurs but ones suspected would certainly be overlooked in the differential diagnosis. A large tumor of an atrium with a ball valve effect on either the mitral or the tricuspid regurgation with murmurs affected by a shift in the position of the body would certainly be amenable to clinical diagnosis if kept in mind. In regard to cardiac thrombosis and symptom most likely to be produced would be hemorrhage pericardial effusion and

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Mair G B Pellmryn Repot n th Us of
Wh le Skin Grafts a Substitut f r Fa cial
Sutures in th Tre tment of Il rnia Brit J
S g 945 3 38

The auth ses whole skin g aft fo c ses of
hern which fasc was f rmerly ind cat d fo
utu H the to cut grafts w eus d Cut con
tai all the el m nt of the skin c pt the p d r
m It is ela t c nherently ct and compos d f
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tr nsplantation acco d g to Uihle n (939) these
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graft and becau e f the t mulus in tated nd ma n
taned by the te n und which the graft is
sutur d a metapl s into sto t conne t e tissu
t les pl c The autho states th t th danger f
p dermoid cyst f mat n is negligibl when th
cut s gr ft ha b en in id unde t ns n

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that the h rs h d b n sur eu d d by a mas iv
f e gn b dy exact n nd that the h rs a d th
cti e c ew r in tu n be ng cap l ted by
firm fibro s stroma

The a tho has ed whol k n grafts 1 89 ca
f diff r nt types of h rn with at f ct ry es lts
Howe e insufficent t m ha l ps dt al t th
cu en e ates accurately Jo r r G str MD

GASTROINTESTINAL TRACT

Taylor H An Ope t on f Removal f Ca l
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ag g t t my B I J S g 945 3 394

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a p c d r s of course a form dable u d rt k g
but ths s a ns deration h ch m t be d
ag nt the h pel ss and d tes g alte n t f r
a p t n w th ag th f th es ph gus o r c d a

Th op at n has be n p t int pract e m 3
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f th ppos t d f th best d ath f m
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h taking f food by mouth nd enj ng h
lif at h m ghie n m ths lat

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suspensi n n rder t r d c th i section of th
g owth Br ath g cise in t t d and th
patent faml r ed w th the ygen ma k m
peparat on f the post p r t e per d Pel m
inary j j nost mys n t n ces ry f th e b bre
a g od response t th se measu b t it may be
requir d if the es phag l bstru t has n t s f
fic ntly d m nish d u d r t catm t

Cycl p opane and oxyg n admin ter d by a
cuff d endot ach al tube th m th d f a esth
sua d pt d n o de t g e th esth t n
h mpered cont ol of esp rat on by m ns f post e
pes ur when th chest open nd th phy log cal
mech n m for exp d g the l ng cann t fu ct
The p t n comm c th the ett g up fa
d p t n fus on of bl d f flow d later b pla ma
whil n nt cip t a fa l agth diss ct b m
ures t k p th pati t w ma take fr m the
outset and pub ate a d blood p essu re d gs
e tak n at fitte min t t l

The p oc du e f b th the pper half or
t o thurd of th phagus will fi t be de crib d
Fo th a right th ac t my chose in rd thar
th d s ect on in th g f th aort rch m y
p o c d m re r ad ly nd r is n The pat nt is
ther f placed n h l f l f lat ral pos t on a d
has r ght a m pp t d b a asist t as it ul
b ces a y t m t d ring the ope at on Th
ight pl u al ca ity pe ed th ough th bed f th
s th rib d n p r t l dhes as f th lu ga
p at d nt l t l es th m d t n m and the
g o th n th es ph gu e pos d l f th
b u nhlt t f th m d t n m and th
pl ur l c r g n d the y g i d ded
and th g th is g tl d c d f car b m g
t k t a d t a g th l f t jle ra b lo Fv
th pos t pes th t h ch a te
m y h al ul ct a l f t occurs ther
d ng l c nt lat l p n m th r w th b
truct on of th p lm n ry blood fl w a d g e
ci culat ry f f r Th pen g ho ld th r f f
be ca f ll ut r d b t f th is t po bl vt

pect f m peptic ulcer for instance th pain: not
rel eed by food intake The question of pathog ne
sis open to gum nt and diff rent theories are
discus sed

E rope n and Am rican a thors d ffer in their
p n s concern g th frequency of the disease In
Europe it s cons der d s b extremely frequent
her s Ame rican workers (Eustern n and Balf r
M v Clinic) belie e t b rare The author tries
to acco t for this d v gence of op nio by the fact
that the E ropea wr ts base their d agnosis upon
gastro copic findi gs whe e in Ame ca the d ag
nosis is bas d on cl nical symptom

Te ca e h t esa e r p r t d and d scussed s f
th ca es occurred after gastroenterostomy d s
after res cti n Th pati nts d velop d cl ncal
sympt m f gastrit s f m two to thirty years after
the pe t n ng of the case gastroscopy r v al d
typical g tritis whereas n i cas nly n gast i
tis as found by gast oscopy The lesions wer
local d mostl at the toma nd at the anast mos
of the ntest e There may or may not be fee hy
d chl e cid The p ognos s i poor

Although som cl ncal improvement was achie ed
by comb nat n of the Sppv tr tme t d daily
g tric lavage no improvem t of the gastroscop
findi gs uld be bserved after the t eatme t
M cin t e tment e med to b ineff ct v

W E R M SOLMITZ M D

P l P B a d L e T F Th Use of Omentum to
Cl s P r f rati on of th Stomach 4 h S g
945 5 7

It s common p act ce to cover pe forated ul rs f
the st mach w th tabs f om tum e p cally hen
th adj cent gastric ll i st i d rat d and f i bl
f rsati factory clusu e of th h l w th sut esal n
F me tal t an plants grafts h e been r c
omm d d f ths purpose b t on the tical
grounds it may be quest d h th r th p dure
i sounds g cal practice One m ght exp ct the f e t
an pl nts d p iv d temporar ly f a blood uprl
to b e p tle loth to th d gestic ction f
g stric ju c and to infecti n which ure t b
p es nt t least j a t of th t me In th cas the
afer proced ould b to c e the d fects w th
nily ng omentum h ch p r umably ould sfer
g eater es ta ce t both d gestic a d inf t n

Thea th rs have s d d th problem e p me
tall on d gs With a p t technique n l)
h les e cut in the anter gat c w ll Th h les
were ill b t ly made l rger th n th pe forat ons
enco nter d cl nically becau e t w s desir d to s b
ject the cover g omentum t r l t ely e test
nd al be use m ll h l s in the n mal g st c
w ll h l too rap dly to p esent th p obl m pos d
by th m r slowly heal ng per f ations f pept
ic r C tion th ad was u ed fo s t es and l ga
tures All the n m l s w e all wed wate and food
(d g pell t) ad lib tum after op tion

Living m l l patches o tab we e u d success
full t cov e r l t iv ly l g h les n the st m chs

of does S ch seals appe red t be h ghly rer stant
to digestion and infect n and gave the g stric de
fects time to heal

On the other hand free omental transplants s mi
larly employed bei g t mporarily without any blood
supply we found to be susceptible to infection and
the corrosive action of gast c juic Nec osis nd
pe f tion of th graft occur d n many instances

These experim ntal results suggest that in cl nical
urg cal p cedure s it is mo e at i nal and safe to
us l ving t ssu than free omental grafts to
perfo ated g atric ulcers or to re enforce l n s of
anastomo is

Jos H K NAR T M D

Cust r W C Survival aft Gastric Resection in
Ca cin m f th Stomach S gery 1945 7
5

O r a f rteen year per od e pl ratory laparot
omy for ca cin ma of the t mach was pe formed
on 463 pat nts Of the 41 e e e cons dered to
have pe bl lesions a d gastric res cti on as per
formed The f llow up clinic a abl to ca ry
thr ough a tudy in 96 ca e hich can be class h ed
s follows

Operati e d ths	Numb r	
F tal post pe atu		9 9 37
D th s d th y s (t incl d g		
bo e)	3	3 95
P t i s faili ng th h e ye e years	34	35 34
D th th th re to fi ye t r v l (5		
p t i s died f th ca se nd had		
d ce f ecurr c)	36	37 59
D th th fi to e ght y t r v l (
p t i s d i d f th ca nd had		
evid f curr ce)	8	
P t i s l a d w ll f ght y rs	8	8 75

To summ rize there e 4 pati nts ith an
establ sh d diag nosis of c rcin ma of the tom ch on
h m g tri resect as perfo med After fi e
ye 27 06 per ce t w al e and fter ght
ye 18 75 per c t w e till liv ng In contrast
the e wa a group f 8 pati nts in whom the d i g
nosis of operable gast c cancer had be n made i ho
refus d urgery The n o tality of this group of
pat t was 100 p c nt at the end f th e e years

JOHN L LUNDQUIST M D

E g l G C Th Creation of a Gastric Po h f l
f w l g Total Gastrect my S g 945 57

Thi r p t deals with one f the problems foll
g total g trectomy nam ly the nability of s me
pat e ts with n e oph g jejuno stomy to handle
v mall fe d ggs without a fe l g of f illness and
d scomf r b cau of the la k of phys cal space in
th j j un m to ccommodat a mod t ized me l
Th symptoms of d st ess in the case p es nt ed wer
ot d e t cont ctu re stenosi or pasm f the
esophago j j un l ana tomosis they we e r liev d by
e d ry operati on creat ng a pouch ut of th
sfer nt and aff ent l ps of jejunum The pat ent
was a fifty even year old m n wh had a la g peptic
ul r n the less r curvature f the t m ch in v l

ing the loop 3 cm of the esophagus. Because of the induration of the rest of the stomach and associated gastritis it was decided that the last part of the stomach was indicated.

The resection of the diaphragmatic peritoneum as freed where it crosses the esophagus. The anastomosis of the esophagus to the jejunum was done after the method of Fahy. The jejunal loop brought up anterior to the transverse colon. The great omentum was suspended to prevent dragging on the afferent jejunum. A Jutt tube was passed down the esophagus and into the afferent loop of jejunum for postoperative feeding. The tube was removed on the 14th day and the patient was on a soft diet on the 15th day. The patient complained of fullness and distress after eating. A barium x-ray film showed the anastomosis to be functional and of normal size. The esophageal and symptomatic distension ended on the twenty-eighth postoperative day when it was decided to operate and make a pouch out of the afferent and efferent loops of jejunum. This was done by creating an anastomosis between the loops of jejunum. A minor similar to that employed by the Finney group (oduodenostomy). The patient had an uneventful convalescence and six months later was able to eat a full diet of the meal daily.

These observations in the case of fatal gastric resection for carcinoma of the stomach in which the procedure was carried out at the same time as the
C. T. N. J. M. L. Lister, M.D.

Acute Gastric Perforation of the Stomach
The stomach was removed and the duodenum (11 cm) was found to be perforated at the junction of the duodenum and the jejunum. The patient died on the 14th day.
J. M. L. Lister, M.D.

Perforation of the stomach of the duodenum results in generalized peritonitis and death if the patient is left alone. In the present case the authors report a case of perforation of the stomach and the duodenum. The patient was a 45-year-old male. The patient had been ill for several days with abdominal pain and vomiting. The patient was found to have a perforated stomach and duodenum. The patient died on the 14th day.

The patient died of the perforation of the stomach and duodenum. The patient was found to have a perforated stomach and duodenum. The patient died on the 14th day.

solution of the stomach. For the hypertensive patient, the patient was found to have a perforated stomach and duodenum. The patient died on the 14th day.

There has been a great improvement in the results of surgery in the treatment of the patient with a perforated stomach and duodenum. The patient died on the 14th day.

The patient died of the perforation of the stomach and duodenum. The patient was found to have a perforated stomach and duodenum. The patient died on the 14th day.

Bleeding from the Stomach
The patient was found to have a perforated stomach and duodenum. The patient died on the 14th day.

The patient died of the perforation of the stomach and duodenum. The patient was found to have a perforated stomach and duodenum. The patient died on the 14th day.

There has been a great improvement in the results of surgery in the treatment of the patient with a perforated stomach and duodenum. The patient died on the 14th day.

cat s itl illu trative cas s The indications f r
primary res ct n a

Pe f ted carc no na f tl st i ac l itl
lc mite i res etabl lesions

2 Perf ate l p ptic ulc rs as ocrat d ith rec nt
s m lt eous gross hemorrhag

3 Perf rate l peptic ulc rs a ocated with fix e l
pilor c bst action

4 Recurre ng pe f rations

5 Ierfo at on with ins gnificant soil ng

6 V ry early p fo at on occurring in the ery
ung

Probably under no circum tances should r secti n
be und taken unless the pat ent is in fair cond t n

r f ably young and the perf ration of n t ov
t l e hours d rat on

Acute p foration of a ca cinoma of the stom ch
nto th fr eper t cal cavity is not c mm n but the

auth was able to c llect 2 7 cases from the l iter
atu e in wh ch the d agnos s had been est blishe l at

op ation postm rtem exam nation In lv 7 of
the 27 ca es s it alleged that a corr ct d ag os

h d bee made pri r to perat on o postmort m
e m nation Mo e astonish g was th f q ent

f il re to ecom eat peration th t perforat n h d
occurre l n a carcinomat us crater instead of a be

ng pepticulcer This w uld indicate that many of
the carcinom s which pe forate are small and rel

t ly confi d les n p esum bly ut bl for
res ct n The two n st mpo t nt problems lat

ing to perf ated carc n mas of the st mach s
frst recogn t o of the ca cinoma by r tun biop y

and seco d ope tive man gement In pp o
mately 50 per cent of the ca es a lopes t ti n

exists l caus of a lv nc d perito itis from ept c
s l gordelays dint r t ion o b ca e the t mor

n t res etable The d ficult es f s mple clos e of
these perf ratio by utur is appa nt It is th

autho s opi on that th hazard of g trect my
the pre nce of a d f sely oiled pe it neal cav t

h s b en gro sly overest m ted and the haz d f
l akage f m a sutu ed perfo at on n ca ci matous

t ue mu h underestim t l

When perforated p pt c ul as cat l ith
recent o s multa e us h mor hage the h mor hag

cont butes enormo ly t th mo t lit a d t
appear that s mple cl su e of th pe forat n

ad q ate beca too t n t fal t c ntr l the
h m rh g Postm tem ex m n t n h bown

th t thes pati nts oft hav m lt pl leers a d
that hem rhag u u lly ari es fr m th nperf

rat d o e Th r f g st ic es ct hi h r
mo es the t ulce be ng area nd ll es f

h mor h g is nd cated these ca es
Repeated or recu nt acute pe f ti n

nomm n b t p t is n th cat g ry d v l p
ery acute ul rs h ch perf rate th l t l

w n an l man f th n ha n lc dathes
and ev nt lly requi res ct on lns h as st h e

s adeq at nd cati n lo em ge cv es ct n at th
s m f th econd perf rat n if circumsta ces re
fa rable

M t of th f lo ic l st ucti ns s eated itl
perf rat n a e due to inflamm tory lema th l

raf lly l l d s in ost in tances f l l win r
at In a f ca e the l st ucti n s fted or l

man nt as the result f carr g l nthes ca e a lv
ass mu th f l l l a l l r l purpo e gastrocn

tero t m v a poor ce nd choic to esct on From
th e l enc a ailabl the l terature imple closure

f l f f ated j j nal stoma ulcers ca rie a higher
m t lity th n the subtotal ga tr ctomy or d s

conn ction of the gast oenter stom y

The maj rty of pat nts under th ty f e years
of age who suffer from acute perf at on do not re

main fr e of ulcer symptoms f llov ng simple cl u
and n many instances have recurrent ulceration

necessitating su g cal ntervention In the nd of
skilled urg ns r ect on in these patients ill l e

attened itl l tle o no mor pr mary mort l ty
than simple cl sur and the pe certag f pe ma cnt

cure ll be m ch higher

From avail bl stat tical data it appe rs that
subt tal g str c esct on can be performed in th

p esence of diffuse soli g of th p iton al c ity
with n t elve h urs after the perfor t n of ulc at

l gle so s of the upper y stro nt stinal tract n goo l
n k cases with a lo r mo l ty th n that obta ne l

by simple cl sur with sut es The incidence of
r cu re t ulcerati n f llo g simple cl sure is much

gh than that f llo g resct n
J n r l N D Q U I R S M D

Coll F A nd Vaughan H H The Treatm nt
f Carcinoma of the Colon f S g 945

395

A s es of 173 pat ents with c rc noma f the
c l n wh we t eat d by op ration is ep t l by

the uth rs

Of these pat ents 16 2 per cent presented le on
b y nd th reach f resection fo h ch only f l l a

t e per t ns could b ca ied o t R e ction f
the p m r v les n as undertaken in 83 8 p r c t

of the p t i ts Of th latter 19 p c nt had oth
gro m tastases n the l vero perit n um th t re

b vond u gical r m al The e f the resect n
th s gr p we e p l l at e n nature

In 12 pat ents (61 7 per cent) es ct n was u der
t k n with ut ev denc of g os carcinomat u

p d b yond the lymph nodes in these cur mgt
t e h p d for Death o cu r d n nly 1 patient in th

g t in wh ch the e was a chance f operative cure
t cc r d fr m ad anced d a foll g

at e at t mpts to rem wid p al l es ns
The uthors bel ve th t su g cal method m t l

d idual ed t meet the ary g condit on of
d ase

The two tage p ati n at f ctory m t
ca s f canc of the right colon Small les ns m y

l resected in one tage by the expe enc d p rat r
th br l l a t results If th les n d ed nfect d

or xtensive a dr q ures wid d s e t n v th em v
al of the mesocolon and th abdom nal w ll th val
e of the two st g peration emph c l If

TABLE I—COMPARATIVE MORTALITY—ACUTE APPENDICITIS

Series	Years	Sample Percent	Percentage with Success Percent	Percentage with Failure Percent	Percentage with Local Percent	All Percentage
University of Hospital peeling & M h	92-94	99	6	43.4	9.5	
University of Michigan Coll & P	93-94	6	3.7		5	
University of Hos tal P so A C	93-94	3	8.6	43	4	
University of Hos tal H g g rd & k i y	95-96	3	4	36	8	
University of Hos tal R d & Montana	94-95	3	0.8	7		
University of Hos tal St ry & H	98	6	7	33.3		3
University of Hos tal Saff d & S on			7.06	4		
University of Hos tal Barro & Och	94					7.3
University of Hos tal d ham N h Ca	93		8.5	4		
Roosevelt Hos tal N Y C Smyth	90-					
Cleveland Hos tal W k	90-	7				
Brookline Hos tal F h & B h	90-91					

TABLE II—APPENDICITIS—DROOKE GENERAL HOSPITAL—PATHOLOGICAL DISTRIBUTION

Appe d c u t s	cut	pp	u	mpl	645	} P r f t } 73 C } 39
Appe d c u t	cut	perf	t	w th		
bsces						
Appe d c u t s	cut	pe f	rat	w th		
g l p e t	n u t					
I t r l	cut	pp	u	pp d c u	7	
I t r v l	ppe d c u t				6	
I c d t l	pp d e c t m				54	
C a t u	d f t h	ppe d i x			4	
A t u o m y c	ppe d i x					
T b e r u l	ppe d c t i					
D e c i d l	u				3	
O r y u r i n	ppe d i x					
T c t l	ppe d c t m e s				404	

c mpl cat on of phleboth ombos d pulm ry
mbol atu n Wou d heal g was sat sf ct ry d
n eve tat s cc red Th pat t t rat d
e ly mab lati n ell
l acute p r f rat app lct p ti was
d ferred unt l est l n abscc occ rr d S
g caldra agew sd eo ly whe th ab sf led
t rsl Whn th absce sws tnc t t ith
th anter r t r al pe t um d a g a
m de by a post ro e traper toneal st b w d
Occa n lly it was p sbl t remove th appe d
ith th absce sw th o t pll Ho eve ppe
dectomy wa suall perf m d aft r c mplet
ree very fr m r t n tis

BE. JAMIN G P S IR M D

LIVER GALL BLADDER PANCREAS
AND SPLEEN

B y d n E A and L yn J A The G il Bl dde
n Pati nts with P nci us Anemi A Study
f N nvi uali tion nd th Rat of Emptying
G i l l gy 045 4

In a preliminary study the authors observed that the gall bladder was not visualized in 4 per cent of male patients with pancreatic ascites as against 22 per cent anticipated in normal male patients. In 17 of 48 patients with peritoneal ascites an intrahepatic gall bladder could not be visualized in 4 per cent namely in 8 of 23 male (35 per cent) and in 12 of 25 females (48 per cent). The expected incidence of failure of visualization for this age group was 26 per cent.

The authors aimed to provide a review of 105 cases of pernicious anemia among 313 consecutive autopsies and found that 3 percent of the patients had histologic evidence of chronic gastritis or that the gallbladder had been removed.

The rate of emptying of the gall bladder in the group that could be visualized revealed a significant difference. In the male patients the curve of excretion was significantly different from that of the control. However, in the female group there was a highly significant reduction in the gall bladder emptying discharge data. The age of only 69 per cent of the patients in the first group was after a standard meal as against 84 per cent in the control series.

The authors suggest that the same cases permit a more accurate pathologic diagnosis of the cholecystoduodenal junction.

LA O L M MD

Funny J M T Jr and J Hns n M L Primary Carcinom of the Gall Bladder A S 945 4

The authors report 18 cases of carcinoma of the gall bladder seen in the hospital in ten years. The patients were males and females. The majority of them were in the fifth to sixth decades. The first six patients had established length of disease less than six months. The remaining twelve patients had disease from six months to five years. The first four patients died from disease within six months. The remaining eight patients died from disease within two to five years.

The incidence of carcinoma of the gall bladder is reported to be 1.5% in the United States. The mortality rate is 50%. The mortality rate for carcinoma of the gall bladder is 1.5% in the United States. The mortality rate is 50%.

The authors conclude that diagnosis is difficult and treatment is of value because of the frequency of times per day carcinoma of the gall bladder (from 75 to 80 per cent of the cases). The authors suggest that the gall bladder is a source of stones in the duodenum. First made by R M D.

EARLO L M MD

Curr J F Complet Rupture of the Peritoneum B J S 945 3 386

The author gives a detailed case report of a complete rupture of the peritoneum. The patient was able to walk to the hospital where upper abdominal pain and rigidity were observed in an exploratory laparotomy. After 10 hours of observation, the patient was found to have a complete rupture of the peritoneum. The patient was found to have a complete rupture of the peritoneum. The patient was found to have a complete rupture of the peritoneum.

A patient with a complete rupture of the peritoneum was found to have a complete rupture of the peritoneum. The patient was found to have a complete rupture of the peritoneum. The patient was found to have a complete rupture of the peritoneum.

JOHN G ST R MD

Mo t n J Acut P creatiti S 945 475

By means of a special method of determining the blood amylase level, a determination of the type of pancreatitis was made. Eighty percent of the patients had an amylase level below 100. The first series of patients showed a level below 100 and the second series showed a level below 100.

There are two pathologic types of acute pancreatitis—the mucous and the necrotic. The first type is characterized by a high amylase level and the second type is characterized by a low amylase level.

The amylase test is a valuable method of determining the type of pancreatitis. The amylase test is a valuable method of determining the type of pancreatitis. The amylase test is a valuable method of determining the type of pancreatitis.

The dematotype is a valuable method of determining the type of pancreatitis. The dematotype is a valuable method of determining the type of pancreatitis. The dematotype is a valuable method of determining the type of pancreatitis.

After becoming familiar with the amylase test, the author treated 29 cases of pancreatitis. The results were very satisfactory.

EARLO L M MD

MISCELLANEOUS

Hughes F and Lambeth S S Pulmonary Complications following Appendectomy and Hysterectomy B J S 945 7 533

Hughes and Lambeth report the pulmonary complications following appendectomy and hysterectomy. The incidence of pulmonary complications was 4.6% in the appendectomy group and 5.5% in the hysterectomy group. The incidence of pulmonary complications was 4.6% in the appendectomy group and 5.5% in the hysterectomy group.

The incidence of pulmonary complications was 4.6% in the appendectomy group and 5.5% in the hysterectomy group. The incidence of pulmonary complications was 4.6% in the appendectomy group and 5.5% in the hysterectomy group.

of it f u n l s O f t h e p l a c a t i o n f l l
n g f p e l i t p e r a t a t l e t a l t l
t t a f n l s i t u n c e s f r n t i t
n r l n c h t i n 7 a n l l b u l a r f a r c t
f u n d i n t c a

S p l a n e s t h a a s u d u t i n l y n l t l e
r 32 (48 p e r c e n t) c m p l i c a t i o n s a f t e r 67 s p i n a l
a n e s t h e s i s a n d t h e w e r 2 (39 p e r c e n t) c o m p l i
c a t f o l l o w i g s p i n a l a n e s t h e s i s s u p p l e m e n t d
i t h g e n e r a l e s t h e s i s I t s g e n e r a l l y b l e d
t h t t h e a n e s t h e t i c n o t a g r e a t f a c t o r n c a u s i n g
p u l m o n a r y c o m p l i c a t i o n o r t h a t p u l m o n a r y n e s t h e s i s
w i l l p r e v e n t p u l m o n a r y c o m p l i c a t i o n s

T h e r e w a s n o m o r t a l i t y i n t h e 76 c a s e s
T h e p r e v e n t o f p u l m o n a r y c o m p l i c a t i o n
p o s s i b l e b y a t t e n t i o n t o m a y d t a i l w h i c h i n f l u
e n c e n d p r e l i m i n a r y o c c u r r e n c e I n o n t h i r d
o f t h e c a s e s t h e r e w a s a h i s t o r y o f r e s p i r a t o r y i n f e c
t i o n t o o t h i n f e c t i o n r e s u l t i n g i n m e d i a t e l y p e r
t o o r a t t h e t i m e o f o p e r a t i o n T h e p a t i e n t f
i n f e c t i o n i n t h e n e e m u t h o r e s p i r a t o r y t e a d
a l a p s e o f f o m s c e n t e n t o f o u r t e n d y s b e f o r e o p e r a
t i o n i s d e s i r a b l e A n c u t e p h e o f c h r o n i c p u l
m o n a r y i n f e c t i o n i n t h e p r e s e n c e o f b r o n c h i t i s
s h o u l d b e a l l o w e d t o s u b s i d e c o m p l e t e l y T h e p u l
m o n a r y b r o n c h i t i s t e m b e f o r e d u g a n d a f t e r
t h e o p e r a t i o n s h o u l d b e k e p t c l e a r F o r t h e s e l a r
a b d o m i n a l c a s e s t h e p a t i e n t w a s k e d t o c l e a n s e h i s
b r o n c h i p i o r t o o p e r a t i o n a n d a s l i g h t l a n d l n b g
p o s i t i o n w a s u s e d d u r i n g t h e o p e r a t i o n T h e p a
t i e n t s w e r e u s u a l l y e n t u l a t e d a t t h e e n d o f t h e
o p e r a t i o n w i t h c a r b o n d i o x i d e a n d t h e i m p o r t a n t

f l l l r e a t h i n g g l n p e r a t i n g n l
i n g t l l g s t r e s l l l e r e c e i t l
t g l a n l v c t l n c u g l g W l l
l r c h i a l s c r t i n a l u l y p e n t a n l t l
t a t t a l i g d d i c u l t y p e c t o a t i g c a b o n
d i d a d o v y g n e n t i l a t n a s g e n t w i c e
d a i l y

T h e p h y s i o l o g i c a l i n h i b i t o f c o g l u n g c a n n o t
b e v e r e m p h a z e d C o u g h i n g c a s e s a p i n i n t h e
o u n d a d t h e p a t i e n t t h i n k s o f t e a r i n g t h e r p a i r
w i t h t h e d e v e l o p m e n t o f a n t h e r h r n a v h c h i s a
r e l t a n g i b l e e x p e r i e n c e w h e n a s h e p r o b a b l y h a s
n e e d e d o f p u l m o n a r y c o m p l i c a t i o n I n t h e
g r e a t n o r t h o f c a s e s t h i s i s e a s i l y v e r c o m e b y
e x p l a n a t i o n b e f o r e p e r a t i o n r e p e a t e d d u r i n g t h e
p e r a t i o n b y t h e a n e s t h e t i c t a n d b y f r e q u e n t v i s i
t a t i o n a n c e a n d p e r s o n a l c o n t a c t p o s t o p e r a t i o n l y
N o t t h a t o f t h i s r e a s s u r a n c e a i d i n g t h e p a t i e n t
i n c o u g h i n g b y h i d i n g h i s w o u n d w h i l e c o u g h
a n d a t t i m e s g i v i n g f e r a p s l a p s o n t h e b a c k
T o r e f o r c e t h e p s y c h o t h e r a p y a n d a c t u a l l y s t i m u
l a t e d e e p b r e a t h i n g c a b o n d i o x i d e a n d o x y g e n
h a l a t o n h a v e b e e n u s e d f e w t i m e s f o r a f e w d a y s

S u l f u r d i a z o n e a n d s o d i u m b i c a r b o n a t e a r e u s e d
r a t i o n a l l y w i t h p u l m o n a r y c o m p l i c a t i o n s b e c a u s e o f
t h e f r e q u e n t i m p o s s i b i l i t y o f d i f f e r e n t i n g i n f e c t i o n
f r o m t e l e c t a s i s e a r l y i n t h e p r o c e s s a n d b e c a u s e
a t l e c t a s i s f r e q u e n t l y f o u n d t o b e a s o c i a t e d i t h
f e c t i o n

C a t h e r a p i r a t o r y b r o n c h o s c o p y i s a d v o c a t e d
i f c o n s e r v a t i v e m e a s u r e s f a i l

S P H E A Z I M V M D

GYNECOLOGY

UTERUS

Hilberg S Re urr nc In frad ted Carcin ma
of the Ut ine Cervi (Study b r R da bei
bestrahit m Ca cu ma ll t) i s ad l
St kh 944 59

In rder t judg the n mber of ab olute c res
btained at th Rad ylog cal Clin c in Lund only
the m t al for hch t atm nt as fin h d by
the end f 937 c uld b lud d in th s study
Th mate al cons t d of 4 s ca es nd of th s
44 (3 4 p cent) r cu ed

H w e thr ga dt th p obl m of recurrnc
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c nst tuted a g o p of 535 pat ents t eat d up t th
nd of th v t 939 i lma h ali gh d occurred
n 28 a d f these 8 pat i nts go l r de loped a
ecur enc a total rate f 32 p e t T enty fi
p r cent f th se recu rreces re local that they
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v g nae wh n first d t ct d Th uth r then at
tempted to determine wheth r thes ecu rnce
co ld b f tallied by hyst c tomy or r mo l
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diat on t em ats W th th advice a d n
cour g m nt f Pr fesso A l Westm n t this
t me our cto of the g nec l gal clin at Lund he
att mpt l this meth d of f el m nary r radiati n
b the St ck h lm method and f llo ed t by hys
t rectomy a f w ks lat r P ofess r Westman
lad do n the gu d ng p cle that o ly tot lex
t r p ti n f th uteru h uld b done the Werth m
operati n be ng res r d fo th ca s in which
ope able xtraut r m tastases are disc ed t
operati n

Ther fore during the per od f om 935 to 1939
inclus 5 women we e p rated upo bv th s
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t nt who had nde gon rr di t n treatment
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p rat on gland m tastases along the co ree of th
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de was fo nd ca es Of th 8 p t ents perated
upon by the We th m meth d 3 de lop d fist la
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A trace f cance w fo nd in 9 of th 6 or n
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ated upon a ly thr ew e ks aft r ces t n f th
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cancer of th cerv

Of thes 16 pati nt s (5 per c nt) are st ill re
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gu nai r gon and pogr ed d pit t l ad m
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r ma n n 3 of the pat ent t l l free of sympt m
r a fre f symptom fo the rs f th
oper t n but th n d eloped m tast s n th
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pate t l t l l v n and s f f s mpt m s fi
months fter the la t surgical int re c

Of th 5 w m n h emed to ha tal res d a
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f f s symptoms fo r y rs fter th p r t and
the fifth wh at op at exhib ted ital can r m
a param t l gl nd altho gh no ca as i d
r th c r v x t l l l ing f e and on h a f y e r
after the t r p t n s d is f of symptoms

Th 2 p t e ts hos c r v ce c t d wh t
seemed t be d tal z d ca c c l s d ma ed by
r adiatio e still l and free of symptoms
thre a d e half and f u nd on half y rs
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On the bas of the esult of his est g t as
nd con derat n of th end cat oms n l t e at e
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y o ng r w m n th f m of per to be p at ed
n l g cale J uv W Bxx v l M D

ADNEXAL AND PERIUTERINE CONDITIONS

Will tt J and Shell J M lgs Sy d m in a
Ca f M f illool P d m clia Cy t
d n m f th O ary Am J M Sc 945 99
3

I th l t f e rs r g tt t h s be
g t th as ati f th m o fib m om

GYNECOLOGY

UTERUS

H lth rg S R c nc in Ir dl tcd C i ma
fth Ut in Ce i (St d) R d b
b t hlt m C c m ll t) f i d l
St ckh 944 5 59

In d t j dg tl umt r l bsol t cu s
lt : el at th R l l gal Clinc in Lu d o ly
tl mat ial f h h t atm nt s sin hed by
th e l f 937 c ull be n lud d in th tudy
Th mater l en it l f 45 c s a l of thes
44 (3 4 per c nt) ver cu l

H v r v th g rd to th pr bl m f c rrence
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e rr c tak plac ithin th fr t y r f l l g
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c t tuted gr up of 535 pat nts r t l p to th
end f th v ar 939 l mary h lgh locu rel
n 28 r and f the 28 p t s 9 late d l p la
r cu renc a total r t f 32 p r c e t T enty fve
p r ent of th rec r nc er l c l that s they
c nf l t th p t r v or f n s
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tempt l to l termine h th thes r cur c s
c ull b fr tall l b hyst r c t m r rem al
f th in l l a after th c at on of the r
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t n l t r f the g n c l g c l linc at Lund h
tt opt d th m th l f j relm na v rad at on
b the St ckh lm meth l nd f l l el it by hys
t r c t o v a f k lat r l f e s or W t m n
la d l n th gu l g p inc j l th t ly to l e
t r p t n of th t r us should b do e the W th n
ope ation b ng reserv d f th ca es n h ch
operabl vt auter ne m t sta es ar d e cr d t
p ration

Th r f d i g the per d fr m 935 to 939
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m l i d m th d T the e m ght l dded p
tent fo had underg e i dat t eatm nt n
1932 but had o retu ed fo hyst er c t m y
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g eat e l une d n inst ne a d
filtrat f can i the p ametr l t u o on
dev as f d i z es Of th 8 p t s per ted
up nly th W t l m m th d 3 d eloped i tul
a rect g n l t l f the dam t f a lead
pencil h ch c s d h n truble an th a e
g al f st l h ch heal d p t n ul afte
fo m nth a d th th d ct g n l f tul
h h h al d a y f t th est bl hm nt f a
pete t al s Th re n tance of f i t l
b t een the bl dd nd ag na sm g th c
not s b j c t l t the W th m p r t i n

Not ace f c s f und 9 f th 16 o gan
xti p ted 5 th e hat app a dt bev t l
c n c ll t l l t (n 4 f th e th

r s d l canc wa u c e d n the c rvi th
fifth th cancer c lls ere f u d pa m l
gland) an l the ema ng 2 p c m n the e
f u l what appea to b a vital canr ma
damaged by r ad t on On p t nt wh as p
erated upon r l th ee w ek aft c s at n f th
rad at t atm t a complet ly cu d ble
anothe v h w t p at d up nt l
months afte i ad at on h b t d c l l s ggest g
cancer f th c

Of th 6 pati t s (75 l r c t) est ll fee
f sympt ms fom th c t ght yea s fte the
op rat n Of th 9 p t ent whom ca c omz
c uld nt be d mo t t d t per to 8 t l l
al e an l f of v mpt m f m f t h t y s
aft r h y t ect m y th n nth l el p d ca cu m
of the ul a th nd o e h l f y rs f t p
t n Th t m le to agulated a d a half
yea later gl l lar m tasta pp ar d in th n
gu al gon a d pr gr d d p te tler d
treatm nt d th occur d a half y r l t r Of th
r m in ng 3 f th i pat ents t l l f r e of v mpt m
f r e of v mptoms f r th e y rs aft r th
pe at n but then de eloj d met t s i th
trans r c l h h e uld b e t r p d Ths
pat t s still h a d fee f v mpt ms f
months aft the l t s g al t r f e n

Of th 5 w m ho emed to ha e tal es dua
f cancer in the x t r p ted c rvi d ed nd
ne half yea l t the third de l ped a h g
m t a s t n th small p l s nd d f s m u e m
l fore t o y ars had el p ed the fo rth st l l es
f r e of s mptom f r v rs f t th pe at n and
th f f th h at op at h b t e d v t al c i
pa am tr al gl d l th ough o nc w f und
th c r vix t l l h g f e a nd h f y e
after the t r p t n and f r e f s mpt m

The pati t h e r v c conta n d wh t
se m d to be d rital 2 d canr c l l dam g d b
rad t i n r st l l l ng nd free f s mpt m s
th e a d n half and o e half v rs
r p e c t e l y l lo ng the e t r p at f their ten
O th bas of th r s l t s f h i s n est t u s
a d n d at i the ind cat ons l t l t w
o th s s b y c t th th ble es that th meth d
i th y of t l l nd r m m d th t n ord t
g a b t t l t of the r s l t s l aliv
v ng r o m en th fo m o f p t u o b p t e d
on a l r g s c l e J o h n W B R E M D

ADNEXAL AND PERIUTERINE CONDITIONS

Millett J and Sh H J M Jg Synd om l a
Ca of Multilocul Ps ud m c n u Cy ta
d n ma of tl O ary 4 m J M S 945 09
37

I th l t f v rs ca b t t h b e
g i e t the c to f th m o f i b m m

11 111 g 1 r 11 1 d 1 t l
r 1 r t () p p t l a t r l g l c 1 l
f d e s t a n t f e l g h t l i t l t
p e n c l l n t h 1 3 (2) t h e t t f l p t h l g a l
f r n r l t n t d g r e s p o a l (3) t h e d r
a t n f t h f a s c a t m j f f c t t h e s p o n s t
t h d g

S e t y f n a l e s a n d 4 n a l s t u d l
A l l c e p t 6 h a d f a l e d t o r s p o n d t o t w m r
C o r s e s o f s u l f a t h a o f s u l f a d z n F i e h d
r e v d n e c u r e o f a s u l f a m d A c c u r s f
s l o n a m l i d s c b e d a s b e i g b t c e n o a d
48 g m

A l l p a t n t s e e h p t l l j f l l w e d j
c a r f u l l y t h f q u n t c u l t j a m h a t n s
A l o s t t e s t f e s i a f t o r m e
c r s e s f u l f n m d e a j n t r p t d a s s u l f n a
m d f s t e s s T h e s e d r u g f a l r e e t h e n
i d e r l e a l l t e f p n e l l n t l r a p y

I n c i l l n s g e n t c u l a l y i n 4 c c f
t r l e l s t l l d a t e r s h e s l u t c e r d g t o
c h d l e s t r u g g f m o o o t 50 000 O x f d u t s
A r t h h o u r s f o a t t a l l o s g f f o m o o o o
t 00 000 O x f o r d u n i t

S e n t y f u r r s e s f p n e l l n w e r a d m n s
t e r d t 71 f m a l p a t i t h e p r e s u m e l t o
h l f a m l t a t g o n h e a a d p r e s u m p
t v f a l e s t p e c i l l r e s u l t d n 6 p c e n t

I t n o t d t h t t h f l r t e f r t h o s e w m e n
h a v g l o w r g n u t l t a c t i f e c t o n l y w a s m c h
l t h a n t h t o f c a s e s h a v g s s o a t e d u p p e r
g n t l t r a t f e c t n 35 p c e n t f t h e l t t e r
c a s e f a l d t o e s p o n s i t p e n l l n A l o t h e l d r
t h i n f e c t t h e l e s s t h e c h n e e f c e e s t h e
c l l n t h 1 3

T h e a u t h r s i n f r f m t h e s r e s l t t h a t e a r l y
i a g n o s d e a r l y n s t i t u t i o f p e i c i l l n t h a p
e p a a m a t c o n s i d t s i n t h c o t r o l f g
r h a I t h e f e m a l i n h o m l a g n i a n l e

a l f f c l t t e t l l h l t c a u g l l
u l l 1 1 l t l t h t h l f n m f
l u g m t h t h e j o s l l t f
H r l M D

S a n d r s J r F t I n f l c l g t h M b i d t y
n d M t l i t y R a t e s i n G y n e c l o g i S r g e r y
B a d n A n a l y s i s f 500 C o n s e c u t i C a s e
I n P r i t P a t S t h M J 945 38 3

F i e h j d c o n s c i t i v r c e t g y c l
o p e r a t n s n p a t p r a t c h a b e a l y d
f m t h s t a n d p o t f m r b d t y a d c f a l t i
a d h a b e n c m p a e l t h s m l e s o f
1000 c a s p o t d 935

T h e s e o l c s h a c a f a t a l t y r a t f
p r e n t a s c m j d t h g a s i f a l t y r a t e o f
8 p r e n t a j a o r t j f f l t y r a t o f o p e
c e t f o r t h f m e r s l t l o s h a d e d
i d c e f m j r p s t j r t e o m f i c a t s
l t h g h t h c r t a l e l c t n e r t r e t r n t h
c o d s e s s t h a n n t h f i r s t

P r e p a t i a n d p t o p e r a t e c a e a b a c a l i
t h s a m i b o t h s s l n t h s e c n d s e h
r f u l l d y t a g a s t k f c t t h r a p e t
m p m e n t p r t c l r l y t h e m l b e r a l s o f
t e f l d s a l i h l e b l o o d n d p l s m a
t r a n f a d t h e e l e d m f q e t e
o f i t t l d c m p r e s o T h s e m p r
m n t s s e l l s t m c a e f l d m o e c n s t a n t
o b e r v t n t d e t e c t c m p l e t n t h e r p
i y c a b e a t t b t d t h i m p r e d r e l t i n t h s
s c d s

T h i g l e d e a t h n t h c d r e s o r d n a
a t t y s i x y e s f e w h d d n t h e
o p e r a t i n g t a b l e d i t r a e o u s o d m p e t o t h l
a e s t h s i a w h i h p r m b l y a a d m i t e d t
r p d l y S h e w u d g i g d g n o t e v t h a
f r m t r h g a f l t m i n e d g n

F D L C F 1 D

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Da J F and D ley D E A Critical Survey
of 2 Diagnostic Pregnancy Tests Conducted
J 945 5 37

Although the number of pregnant women accepted for duty in the Royal Canadian Air Force is only between 5 and 8 per 1000 their elimination at the time of the initial physical examination would be desirable. Because the expenses involved in running routine Aschheim Zondek or Friedman tests would be too great for the results obtained the authors attempted to utilize the colostrum test and the histidine test on a specimen of urine to screen the pregnancies. A description of the procedure involved in the interpretation of the colostrum test and the analysis of the histidine test is included.

The colostrum was prepared according to the method originally described and the injections were made and the results interpreted by one individual.

Aschheim Zondek or Friedman tests were run on all men showing a positive reaction or a pseudopregnancy reaction. Histidine tests were run on these same individuals and on all a pelvic examination was made.

The results of the colostrum skin tests on 542 women are listed in Table I. The tests at the Women's College Hospital and at the Royal Canadian Air Force examining center were carried out by the authors. Forty-three per cent of nonpregnant women gave either a definite pregnancy or a weak pregnancy reaction by this test.

The results of the histidine test are shown in Table II. Of 106 nonpregnant women 12.4 per cent gave a positive pregnancy reaction and in 8 definitely pregnant women a negative reaction was obtained.

The authors are of the opinion that neither of these tests is specific enough at least in their hands to be utilized in detecting isolated cases of pregnancy.

TABLE I—RESULTS OF THE COLOSTRUM TEST

Reaction	Urine (Medicine)		Women (Hospital)		3 RCAF (W.I.)	
	Negative	Positive	Negative	Positive	Number	P
Positive (pregnancy)	60	98	4	6		
Positive (pregnancy) action	3		8		3	
Total positive (pregnancy) action	26	99	3	8	4	
Negative			6	8	3	8
		99	3	99	7	99
Non-pregnant women						
Positive (pregnancy) action			6	3	7	3
Total positive (pregnancy)			6		3	4
Negative actions	3	99.8		6		7
		99	6	99	5	99
Total tested	8		6		4	

TABLE II—RESULTS OF THE HISTIDINE TEST

	Non-pregnant		Pregnant		Total
	N	P	N	P	
Positive (pregnancy)			5	34	3
Weak positive (doubtful)			5		
Total positive reaction			3	27	
Negative			7		6
Total			99	99	99

am l rge gro ps f s pp edly nonpr g nt
omen J R R W also MD

Bigby M nd Jon s F A R gn ney nd Dia
bet B i M J 945 1 36

The deq at use of nsuln has d cr a ed th
maternal r tal ty rat n th p ce of d b tes
but th f tl death rat r m hgh In 94
La re c a d O k l y h d a mat rnal m rt l ty f
per cent and a f t l d th rat of 37 per cent b t
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d l p me t f the p a t o Sugar
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pl cat o f r tu tly t ut ed F t l
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r g exp d br a t milk a on po bl
D e r G Mo ro MD

A b k A J Fit g rald J E F da y L d
R dophl L Ca n m a f t l Cervix d
P eg ney tm J Ob t 945 49 3 7

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II I LD MD

F E G Fl e H dred Con ec ti C r n
S ti n Operati n Am J Ob t 945 49 4

The maternal m tal ty i th frst t se
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was 066 p c nt F ue of the death n th frst
1000 ca es s l t d from infect n of g tal jgn
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Th m b d ty th l r se e w s 438 per
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The l w s p t spr to l sect n th p ra
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E W RD L C TEL MD

II nt A B Ma l Ob t tric II m r rh g Req ir
Ing lly t e c r my Am J Ob t 945 49 46

Accumulat g v d e c d c tes th t ob t n
h mor h g s n the mo t mpo t t a d p haps
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pl a d ell k o co rv t e b t p oced res
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The age f th p t e ts an i f m t t
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The use f th t t e hem f i ge i th s
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S f th Spat t h d ec d p at l e t
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f d b y th pat t s c ld th b p t
l by i at l e a l Th h r rh s m t
p p l v b t r med dd n d t f
p gn cv llo m e gl t a d f ctu
l t l a h t h t d 3 f th 4 l t l
t d j 3 f th pat ts f th rut

The reclassification of the mortality of 501 cases of all of these deaths occurred primarily in the first 3 cases of the fetus which had a cephalic presentation to the hospital. Rupture of the uterus as the cause of fetal death and abrupt obliteration accounted for the fourth death in this series.

Shock as present in each of these cases of severe hemorrhage was a direct result of the volume of hemorrhage sustained by these women was large. A direct result of the large volumes of blood which substituted for both were required to keep them out of danger from shock and to carry them through the hysterectomy.

Cases such as these challenge the judgment and skill of the obstetrician and test his capacity to act quickly and effectively. Instances of such severe hemorrhage are rare in general obstetric practice. However in the small group of cases in which such severe hemorrhages occur risk of death from exsanguination is exceedingly high. Laparotomy and repair or removal of the uterus is the first best treatment to be applied if rupture of the uterus for other types of intractable obstetric hemorrhages is paralyzing in nature. A late result but it should not be delayed to long.

The purpose of this article is not to urge the frequency of hysterectomy, but the treatment of obstetric hemorrhage but to point out its importance. The reduction of maternal mortality from exsanguination of hemorrhage when indicated. The operation is indicated when the uterus the site of allision procoagulation of the uterus hemorrhage that is not accessible for hemostasis vaginally. Hysterectomy is indicated although the usual method of obstetric hemostasis such as proper use of tampons and although the vagina is filled. Once the indication has been the operation should not be delayed for a moment; the cases such as this prevent fatality.

Norton J F A Mortality Study of 187 Deaths in 66,376 Live Births. *A J Obst* 1945 49 554

Of the hundred and eighty even maternal deaths a percentage of from a maternal hospital have three parallel services: (1) a clinical service which is in close co-operation with antepartum, intrapartum and postpartum services and the percentage of antepartum obstetric cases (2) a clinical service office which provides facilities for the merger and of times for the treatment type of patients (3) a prearranged service to which any maternal cases in the hospital may be referred privately.

Fifty six of these 187 deaths occurred in 66,376 live births had sufficient clinical data to warrant the being included in the analysis of the hospital management of the cases. The conclusion of the 8 per cent of the deaths.

No attempt was made to correct these 550 to represent the national (maternal) or per cent of the cases of which the hospital was responsible. The conclusion is as made for postpartum readmissions for hemorrhages (except

aggravation of infection) and a statistical review of patient from the hospital.

The thirty cases presented a relatively difficult problem in assessing the preventability of fetal mortality. While good might have come from the prevention of pregnancy in this group the author is unable to say. Experience in dealing with it reasonably far advanced pregnancy is very unsatisfactory.

The greatest element of preventability in this group was rupture of the uterus hemorrhage, peripartum infection, eclampsia and heart disease.

Rupture of the uterus, peripartum infection and hemorrhage can be combined only by increased clinical vigilance and further improvements in general and special technique.

Some hope for a further reduction in the maternal death rate and the eclampsia group is anticipated by early analysis of the antepartum data.

FD L C ELL MD

NEWBORN

Sniffed HN and Shmuglsky I Purulent Parotitis in the Newborn. *J Ped* 1945 10 945

Porter to this report 57 cases of purulent parotitis in the newborn had been recorded. The authors report 5 additional cases observed during a period of five years in the hospital. The incidence of liver of approximately 1000 infants during that period.

The organisms cultured from the pus in every case the epotomus the staphylococcus aureus hemolytic which is the predominant organism in the nasopharynx of infants from the first three weeks old. It is a potential pathogen. There were no constant etiological factors.

The first as an unexplained rise in temperature from 100 to 104 F from the fourth to the twelfth day of life commonly at about the week of age. The intensity of the fever was a swelling of the parotid gland was not detected accompanied by heat and tenderness. There was also anorexia and some loss of weight. The blood showed a marked leukocytosis (from 8000 to 40000) the leukocytes averaged from 65 to 80 per cent of the total white cells.

After the treatment which outlined the gland rapidly increased in size and became fluctuant in the first few days. It then healed rapidly after incision and recovery occurred in from one to two weeks. In about 35 to 50 per cent of the reported cases the gland became infected during the course of the infection.

A soon after the diagnosis was made by the presence of the swelling of the parotid gland. The authors were by mouth enlarged to twenty-four hours of fever. There was tolerated well. There were no reactions of any kind. As soon as fluctuation was observed in the gland a small incision was made at the lower border of the gland.

an le of th m dible Apr be wa i serted and all
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m rtality i th r c F l A i MD

MISCELLANEOUS

G r r r C D St lity th P t St tu of It
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m d de d b t y t t m e t) A l f
m d M 944 5

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nd bi p p e c m e n f m the t i s t i c h l d b
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b l m tab l m The H n t s t sho ld be m d

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Th autho ucc ded in b gn bout p
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Av e G Mo A MD

TABLE I—RESULTS OF TREATMENT OF PROSTATIC CARCINOMA

Treatment	Median survival (F months diagnosis)	Condition on death	Condition of discharge
N 43 cases	78	N h ge Worse Dead	N h ng Be Worse (9 cases)
Simple drainage (systemic m l os ectomy)	53	N h re Be Worse	Be Worse (24 cases)
Excise 16 cases	555	N h Be Dead Worse	Be (cases)
Excise drainage	6	N h Be Dead	Be Worse (8 cases)
Transurethral resection 7 cases	54	N h Be Worse Dead	Be Worse (36 cases)
Transurethral section drainage	65	N h Be	Be N h Worse (4 cases)
Simple drainage 7 cases	6	N h Be Dead Be	Be N h (cases)
Transurethral section drainage	5	N h Be Dead Worse	Be N h (cases)
Transurethral resection drainage	3	Be N h Worse Dead	Be N h Worse (cases)
Radiation therapy 4 cases		Be N h ge	Be (cases)

f r n g and bed idden pati nt w s con t d int n
ambulat y n i vid al wh b came s lfs ppo t g
a lskowed a w ght g n of f om 25 to 4 p
w thin a period of f om six to nine mths In th
reg rd th y cite the example fa i ty f a -old
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loss f 5 po nd who was f nd to h v h rd
resul t f xed enlarged pro tat and mult pl n
l ged, f m i g ual lymph nod (d noca n ma
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carc ma

f th author t concl ded th t i t nt th

p t tic ca c sh uld be give th ad a tage f
c mb n d therapy th t hes tat on

J IN W B E M D

M Crea L E The End Result f Pr t t ctomy
A Ft Y r Survey J U l B lt 945 53 466

The end results of prostatectomy as shown by the following table in this series of 367 individual cases. Four fifths of the cases treated totally within the five year period following discharge from the hospital. Three fifths of the ordered postoperative deaths were among the treated cases. Five fifths of the cases treated died within the five year period. Of the 39 individual treated cases, 66 died within the five year period. Of the 66 deaths, 66 were among the treated cases. Of the 66 deaths, 66 were among the treated cases.

A total of 14 (3 per cent) of the 367 patients who were subjected to peritoneal dialysis and well by their own admission. Undoubtedly many of the queries were not answered by individual health

The m st comm n surg cal p oced e wa th
uprapubic ucleat o h h was d ne t 17
operat ns

P st per t ho p t l i t n w s t h y t w a d
s ix t e n t h s d a y n t h e c t y h o s p i t a l a n d t n t y e v e n
n d o h l f d a y s t h e p r a t e h p t a l i t h s u p a
p b e r i n g g T h i s p e o d o f h o s p i t a l i z a t o a
r d u c e d t a a r g f s n t a d n e t e n t h d y s
h e m p i r i n g a u e d

T h m t f r e q u e n t c a u s e f d e t h e e c a d a c
f a s i u r (3 2 c a) E y e l o n p h o t (9 c a) a n d
b o n c h i e u m o a (6 c a s) J o n v A L o r M D

MISCELLANEOUS

J n T R L M i t t a d F G A l l S J a d
D d i j S P n i l l i n i n G n r t h A S u g
g e t e d S c i m f T r t m n t L a t L o d
945 48 368

A p l a n f p n e l l i n t a t m n t f g n o h u e d
c f l l i n m r t h a 99 p e n t f 256 c n c u
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a f t r p o s e a n d p e n c i l l a t r t m e t T h t t
m n t c h d l h a b e n o f f i c i l l y a d p t d f t h
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p e r s o n l f t h B r i t i h N a y

W i l l i a m W S c r r M D

P i t o u R V H i l l A J I n g r a h a m N R G o o d
w i n M S n d O t h e r s l i l l i n i n T r e t
m n t o f I n f a n t i l C g n i f I S y p h i l l i s J l m
M t 945 27 582

T h s a b f p e l m r y o t e n e m i n g 69
f a n t s w i t h m a f t e a r l y c g e t f s y p h i l w h
w e r e t e d t h s d i u m p e n c i l l P e c i l l s
d m i s t e d m s c l a l y l e l e t e e r y
t h r e h o r s n s t y i j c t o v p i o d f e
n d o e h a l f d a y s T h t o t a l d a g e s u d r a g e d
f m 16 000 t 32 000 O f d i t s p r k l o g a m f
b o d y g h t w t h n t h e n t s y p h l i t e t m e n t

I g l t h m m e d a p e f e a l y
g n t a l s y p h i t p n l l h b g r a t i y g
C u t a n e o u s a d m u s m m b e l n h a
h a l e d d u n g o h o r t l y f t e t a m n r h n t h a s
b e n s o m b a t m p e r s t t h a l g f r o m t
e l s t o t m t h s A l d r k f l d p o t i s n
b c a m n g a t t h t t y i u h u r a f t h e
s t a r t o f p c l l t h p y R e t b g r a p h e

d e e o f s t e t i s d p p a r d i f o m t o t o t
m t h e a t a b o t h t h s a m r a t x p e t e d a f t e
m e t a l c h m t h e r a p y R e g e s o n o f h p t s p l m
a n d l y m p h n o d e n l r g m e t t h u g h a b l a s
u s l l y c o m p l e t e b y t h r e m o t h I f b m l
s p a l f i d f d n g s w e p e n t n t a l l y t h e s e
t u r n e d t n o m a l i n a l l c a s e s i n f o m i g h t d y s t
s x m t h s

T h e r e s u l t s f b t a i n d f a n t s d e a t t h a t
t h e p t t o t a l d e a n l t m d e l t h p
s h d u l i s n t n t r l y s a t i s f c t r y

J A L o M D

A n d r o n K D e M o n b u n W A d G o o d p a s
t u E W A n E p e r i m t l l t l g t p l
t h E t i l g y d I m m n l g y f G r a l m
I n g u i a l i m J S y p h 94 9 65

T h e a u t h r s m m a r i z t h e s l t s f t h p e n
m e n t a f l l

A m r g n i s m m o r p h o l o c a l l y d t e a l
i t h t h D n n b o d o f g a u l m a g u n a l a d
i t s u e c a p u l a t d b a c l l r y l m s w a s o l t d d
d e r l l y c u l t i v a t l t h y l k o f d e e l p c h u c k
e m b r y

2 T h s a m e m c o o g m a s s o l t d f o m
t h e l e s s f 3 p t n t w i t h g r a l m i g u l

3 T h D o n m c o r g n i m h a t b e e
a m b l i c t l e t a o o d r y a r t f l e u l t
m e d o t h c h r o l l n t o f c h e m b r y

n t h y l k o f l e t t l e g g s n d t i t p a t h o g e n t
f o m c e d g m a c a e a h e s m n k e y s r a b b i t s t
c h u c k

4 E m b r y c y o l k t u p o r t t h g r o w t h
f t h e m r o g s m

5 W h d b c t r a l b o d s t m l t e a p p a r
e n t l y s i n t a c o r a t i o n t h e a n o p a
t e t s t h c t g r a u l o m a m l

6 A c a p u l b s t a c e s o l b l e i n 1/100 s e
d u m h y d r d e p e c t a b l f r o m f i d y l k
t h 1/100 h d r h l a c d

7 T h c a p l a s b t a n g n p p r e
s p e c p p t i n e a t i o n t h e p a t t s r u m
l t f c m p l m e t t h p t n t s r u m a n d s t u m
l a t e s m i l d k r e a c t i o n i n t h k o f p t i s
t h g r a l m i g u l

8 I n t h a u t h o r s o p n t h p e r i m e n t s d
c b c u l t r e m d m s t b l e f t h g r o w t h f
t h e D o o b d y h c h h a h t h r t t b e e c o l
t a t e d o t d f t h b o d y f t h h u m h t T h
d t e r m e w h t e e m t b t h b a c t i n a t r e f
t h t l o c a l g n t f g a l m n n l a d
a f f o d a n f a p p a h t t h o l e f t h
l a t n f t b l g a t g r o t h i c t r a n d t h
n m e t f f u l d t d a

J n A L o e M D

S h r r E T l P l b l U f i n o f E t r o g
n d A l u n i u m H y d o x i d G l i n t h A l s
a g m t f R a l d t J L f B l t 94
53 57

S h p e s n t t h t o a l f t h s f e s t r a
g a n d l u m h y d d b l s (a m p h y l) t h

treatment of nephrolithiasis in which the stone is composed of calcium phosphate or calcium magnesium ammonium phosphate.

The author presents data to show that natural estrogens by increasing the urinary citrate excretion reduce the concentration of calcium ions taking part in the precipitation of calcium phosphate and reduce the solubility of calcium citrate complex. The same effect cannot be obtained by the oral administration of sodium citrate because the result gives increase in urinary citrate almost entirely due to the elevation of the urinary pH by the sodium. The gain in urinary citrate offsets the reduced solubility of the calcium phosphate in the alkaline pH range and by an increase in urinary excretion of calcium. The suggested treatment of the urinary citrate acid without altering the pH and generally without ductility in urinary calcium excretion.

Aluminum hydroxide gel by decreasing the phosphate excretion from the urinary to the intestinal tract reduces the amount of available phosphate participating in the reaction with calcium. Data presented show the relationship between the urinary excretion of phosphorus, calcium and citric acid and amplitude of dosage.

Men given estrogen for the purpose of increasing libido and increasing sensitivity of the nipples sometimes have decreased genital hypereplasia and possibly with all bleedings.

In the author's conclusion states that because of the calcium balance it is permitted to use sodium citrate to the actual effect of the men's health. The preliminary pilot studies present data that later research on the subject.

WILLIAM W. SCOTT, M.D.

W. R. N. A. A. Th. M. I. C. I. m. c. t. e. l. c. J. I. m. A. I. 1945 7 7

This report presents a study of 53 male patients each of whom had one of the types of testicular hypofunction or infestation which so can be the etiological factor in producing the hypogonadal climacteric syndrome. With the exception of men in the female treatment; the same for the two sexes.

The symptoms have been discussed so that the syndrome may be easily recognized.

Testosterone propionate given by intramuscular injection of 25 mgm three times a week has been found effective in relieving the symptom and in the production of sense of well-being. The patients which is the primary objective of this treatment. The medication should be administered for a period of 6 to 8 months. The patient may feel very well within a few weeks but it is best to continue beyond this time for the purpose of stabilization. Testosterone may also be given orally by injection and by implantation. The effective oral dosage is three to eight times greater than the intramuscular injection. In action of testosterone is not so satisfactory. Implantation allows control of dosage.

Testosterone should not be given for the purpose of stimulating potency. While it causes some patients to have sexual intercourse it is promised that it is perhaps better for older men if this phase of the reaction does not result.

It is important that the duration of the climacteric be determined since it varies in different individuals. Some pass through it without much appreciable difficulty, some may have trouble from the time to months and in others the period for permanent endocrine equilibrium may vary from one to five years. The latter group will need termination of treatment for periods of from 3 months to three months. The treatment of symptoms is curative.

J. H. A. LOY, M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Col W H The Clinical Diagn I T atm nt
nd P g osl of Epiphys I Di turb n e in
Childhood J Am M A 1945 7 3 8

The t l g y of ep phy cal le n n t clearly
understo d nd it s imp s bl with ou pes t
ln l dg t l ly the e d tu bances exc pt on
an anatom c b s Th name o te chondros s has
b e appld th Sta dard Nom nclatur f Di
ca to mo t f the conditio n l ng growth
centers of h ch the t ology is b cu at least of
h hn n fed pin nas to th rc u ex ts and
our old and m e s m lar t rms m t b id
tracked f r p r p es fcl s ficat n and f l g f not
f oth re sons

Th pphyses th ugho t the b dy ha e f
c urse a ery egular and consta t anat m c po
tion l th r os ification i al constant fo any
particular cati n S me a very f sh c ters
al ly p es nt t l th whle oth rs may r ma
c m l tely cart lag n us unt l puberty a d it i an
nderstand g f these l f rent pe ds f d elop
ment h ch f rms a bas s for the recogn t on of n
r th l g cal co l t n wh ch m y s p r v ne

In Legg l th s d a e some case c t nly ar
ne r by a d ctor a ds me may p esent s ch
m s r sym pt m th t hen n lar r l s a de fo me
h p s found beca e f d l p ng disab l ty no
h t r y f a l e r t ouble can be obta ed It is th
ns d n e s f on e ch l gely e pon ibl for
th del y op r treatment a many ca s nd ot
egl ct on the part of th pare ts or the physic a
l ghty f e per cent f all p tients ar males
Th y es en a y ng as thr y e rs l ge nd up
t t the te n lth ghan n t after t ly years
i v r y ar The frst ymptom in typical ca e s
ually lmp hich de lps th d y ge on but
i ab e t f r rest and frstg tt ng up in them n
ng E m nati ho s e early th d as
th t th is l m tation of th otat ns espec lly
i te nally d f bd ct n The r entgen g m
w ll be th f nal id nc n ded t nsur the
da o

Jh frst r q em t f f therapy i that eght
bear ng b d c t ed As t is impos b e to k ep
ll child en th th l n bed for th l gth of
t me need d ll healing t tak pl e om
b t t t st be fo d fo the id al Th t g
cal p r pl th as b f nd t b at i fact r v in th
r ga d and weight b r ng th o gh th hip ca cer
t nly be cutt a min m m f the splint well fit d
In the more acut cases th brace n lead f be ng
f st ed t frul n the h e t nd d to a f t
y e p pte belo th h e th the h e n the
n rm l d b l t pt qualz the l ngth of th two
l C mplet f i a o of h f j t n pl t r of

I ar cv r nd cat d u les f p rpos f
t an p tation

The ge eral t eatm nt should cons t f those
measur s neces ary to k ep the chld in go d h lth
anlth us of th thyro d gla d It has b e claimed
that w th ea ly rec gnition of ths cond t d
quate th y o d the apy will el m n t the ne es ty
for protecti treatment b t e f thyr d will
hu ry th healing p oc s nd th a th rs lunt d
e pe e c m k s h m f l th t t d s it is certa
thata o d n of w ght bear g es ent l b utl
the bone i f m eno gh to as ume ts f l luncti n
Th can b l ttle d ubt that a p act ally norm l
h p will result if th c ha b e seen ea ly nd
p oper prot tion has b en u d Those ho b
f t t ng nd bro den g f the cap tal ep phy at
the frst x m t n w ll p bably alway ha es m
d t tion f the h p and a disab l ty wh ch alth g
negl g bl r bse t at frst w ll b ome gr at s
the age increases E w th the p rrently perfect
reco eries the ll be tende cy towa d th d el
opm t of d g n t t rth r t s l at r l e

Slpping f th pr im l f moral p phys s occurs
about tw c as l t n b y a i g l s a d m cl
to 70 per c t f the ca es the ge eral body bu l d u
th t hich f eq ently desc b d as the F lch
type l i d v d l The smaller p rcentage of pa
tents a e app r tly phy call y n rm l hldre o
the tall a d th rap d ly gro g type

E am a d n h th t m ty me e ter
nal r t at o th a definit l m t n i f merna
r t t on and bd ct n When t t g h s f do
the t al t tend to g int e te nal rot tion d
abdu t n but hyper tens n may be ev n frer
than the no mal side In lat r cases th r will be
ome sho ten ng of the ext mity with ele tio of
th t ocha ter abo Nelat n s l e All f thre
s mptoms and ch cal h dngs red t a grad al
slpp g nd otat n of the f m r al h d dow w d
and ba k and th eck

The lat r l r tge gram s b lutely esse tal
f m t kes a not to be m de

Th pogn f n m l r n ar no m l h p
good o ly if th ca d d g o d n th
e ly t ges th n d l a y n n t e ng p e tre t
m t Older c es ll h ome disab l ty om
t m f a p no nc d d gr e

T e t n nt i add t n t th u e f th y o d
th cr e p odu t med t o e t o f th
d f e m ty and th p ent on f f u th slpp ng
f te th ha b c m pl bed The th has
b c m therapeutically mo nd m cons r v t e
n the tre tm nt of the ca s In c e n whch
app mate d ct is obta n d by kel tal trac
ti and th m y tak e eral w eks r m r
rly c es hich th slpp ng s y et m m m l
e th l ghter tr t n must b m nt d nt l th
j phy all cl es n t n f the h adm t l

as used by operative means. Multiple drilling slice bon graft through drill holes a large bone graft the Smith Petersen nail and vitallum screws have all been used for this purpose and each has its advantages. There is probably not much choice between them but it should never be forgotten that the operation of whatever type is only a means to an end and that end is union of the epiphyses to the neck. Until this has taken place recurrent slipping may happen at any time.

If reduction cannot be obtained by traction we must decide to manipulate the hip perform a radical operation immediately or wait until fusion of the epiphysis has occurred in the deformed position and then resort to some type of osteotomy The author has seen some excellent results from manipulation but many more poor ones with stiffness amounting almost to ankylosis and not infrequently aseptic necrosis of the head The same is true of open reduction if the head and of wedge osteotomy of the neck and hence the choice inclined to postpone radical treatment in these cases until after chronic osteomyelitis has been performed In the meantime progress in the following must be supported by recumbency without traction or by the use of efficient analgesic and spinal anesthesia Thoroughly well established correct deformity will allow at least a large relief of joint arthroplasty pathological changes

The distance of the epiphyses other than at the hip which we used in the classification of osteochondros are of relatively unimportant importance. The diagnosis has been made by the epiphyseal age which was taken to rule out more severe conditions.

Very brachypylous does not occur until puberty at the epiphyseal plates of the vertebral bodies develop at that time. Most cases are seen between fourteen and twenty years of age and the smaller groups are somewhat less. The lack of acute symptoms and the rounded curve of the thoracic gibbosity are characteristic of tuberculosis of the spine. The roentgenogram makes the diagnosis clear. With treatment the rounding of the spine may be corrected but in the end the deformity is the only symptom and as the spinal epiphyses may not unite the body is usually in the center there can be progress on up to this time. If seen and recognized early the deformity, at least can be prevented and the symptoms allayed by recumbency, plaster of Paris or brace support, and active muscular exercise to strengthen and straighten the back.

Osteochondros of the tuberosity of the tibia (Osgood-Schlatter disease) is a fairly common condition in active adolescents. It is characterized by a localized tenderness and swelling of the tuberosity of the tibia. The symptoms are best relieved by rest and the use of any residual ability.

Kochler's idea of Freiberg's infection may require rest and protection to relieve the symptoms quickly and no disability results after the epiphysis has united. A full length steel in the sole of the shoe

The lesion in the tarsal navicular bone to which Koehle's name is given although similar with regard to pathologic change treatment and prognosis is not of course in an epiphysis.

ROBERT P. MONTGOMERY M.D.

Dub H P Aseptic Necrosis of the Epiphyses and
Sh t Bone s *J Am M As* 945 73

A case of necrosis involving the epiphyses and also the primary centers of ossification in the short bones have been described by different observers. Unfortunately, in most instances the lesion has come to be known by the name of the original observer. This has the disadvantage of giving no hint as to the underlying pathological process and further of implying that in each instance we are dealing with an independent disease which bears no relation to the others in the series. These diseases have been known as under more general headings such as epiphyseal osteochondritis and subchondral necrosis. It is now generally accepted that they all represent the same underlying pathological process although there is no general agreement as to the exact etiological agent.

That some form of trauma with secondary vascular occlusion of the involved ear is responsible is held by many. Embolic occlusion has also been mentioned as a cause and endocrine dysfunction has been invoked by others.

TABLE I—ASEPTIC NECROSIS (PARTIAL LIST)

Primer C t rs

V t bral body (Cal 925)
C rp l scaph d (P se)
Sem l d lt (K₁ bock 9)
P t lla (Kohl 908)
Astragal (M h t, 9 9)
T rsal scaph d (K hl 908)
Medi l cu f rm (B schk 014)

Secondary Cite

V t b t p phys (Sch erm nn 9)
 St nal d f clavul (Friedrich 9 4)
 H d f hum rus (Hass 9)
 Cap t llum f hum rus (P 9 7)
 H ad f radi (Braul f d 935)
 Ulna distal (B rn 93)
 Head f m ta rpl (M la re 19 7)
 Ila rest (B chm 19 5)
 P b ymphy (V Neck, 9 4)
 Ischu p bc) t (Oldhe g 9 4)
 Ilea f leu (Legg 9)
 Foot t ff (M l f l 0)
 t ll (S d g R la sen 0)
 H d f fuba (R ll 0 9)
 f le l f ubia (Ooood Schf tte 903)
 O calus (Se 9)
 M t t rsals (Fre be g 9 4)

Th utl r tuly cl l's meas r m nts mal
54 ault lu n fem r ele ted tr ndom fom
dr el n t m cal l b ratory spec m ns Of th
number 48 had a single nut ent ca al hile 6 v e e
l c red to po t o s ch c nals T o f mora
f om the ne born e secu ed nd ident cal tudies
made on th m

In mak ng the me surement of th f mora t v s
d ced that m re e ct data could b secured by
mak g o tg b am f the bo s and mea ur ng
them Th p oclue as ca red ut by frst
passing a small n dl al g th n tre t can l
th mo nt ng the b ne n e tt v th clay so
th t roentg n g ms c uld be made In each ca e
the rays l l p to the c nal at a ight angle

R gul lta p eel flm as used in making the
tg o k am l p ur s wer made at 7 inches
th 75 peak k lov lts nd 2 mill amperes f r
fifteen e ond

In det m ng th l c ti f the met phys s it
a n t d that afte cl sure of th ep physis a s it
abl ari t n nd ty d l not l ys appea t
rev l the ite of clos r T o p cum ns in th
gro f rev led ep phy al l nes h ch wer n arly
obliter t d f m these po t were f nd which
ere pes nt in ll f th pe m nd hich
showed def itely the plan h r the met phys s
a d p phys f sed

It th n became pos bl t measur th o all
length of the l ft a lth d ta ce b t een D gby
te of in ti l feat n lth d tal and p ox
male e f the h ft

The tho c ncludes th t the D gby m th d of
l t min g perc ntage f gr th fr m g en
p ph l l e in a lo g b c (l) c mpa ing th d
aphy al length with the d st ne f m the metaph
v is to the ters cu n f the nutr nt rt v a d
the cent f the m l f ca t) n r lable and
th ut so n lat n Th figu es d r d by the u e
of this meth l) est mat ng the perc ntage f
gro th fr m a g ep phy l l e a e in ccu at
Ro r t' Mo r cou M D

Batt em R G Th T m t f Arthritis
P In l d m r l n Synthetic A l g l
A I I M 945 2 382

Dem r l appr a he the p te cy of m rphi but
th ad l ti l b lty mu hle s tha i y op ate

d ri t Fu th rm e l m r l has b cn a l m
iste ed fo m ny ks mo ths th ut crease
i the do g t a hiev the same alg s c ffect
Du i g th pa t four years 83 h pital ed pa
t ents nd 73 amb latory patie ts we t eat d w th
deme l All f these patie ts er uff n from
e r p i associ ted th a arthr ti co d too
Eighty n p t nt r c d 92 tr als of dem l
pa e ter lly nd patie ts r c i ed 13 tral
orally Both methods e u ed i th treatm to
28 patie ts

Pa terally adm t ed d m r l resulted i
sati f ctory a lges 83 pe c nt of th tral
a d f rther 3 p c nt of th pat ts ce d
mod rat r l f f p Th adm istratio f no
mgm p r nterally cry f ur h s was s f e t
cont of the pa f thr m ho r n th m aj r
ity of the pat nt f s o nt and re c t
wer n ted Th same r ult was ach e d a l g
as th m dicatio w s g en t gula nter ls
Exc ll nt r sults we obtan ed in levi the pa
of th e t c d m gadle f ca sat n
Sat fact ry r ults e al o b r y d i pat ts
uff r g f m my t cute b r st ad a ced
osteoarthr t nd heumat id g coccal a d
pe fic inf e t s rthr it Complet ly sat f ct ry
results wer obt i d n 6 p ce t f th 3 trals
wh d me l as g n rally Th c d it o f
th mb lat ry pat nt was complicated by the
f ct that a high p tag per nc d d z z ness
u m t g a d r ly sync pe Of 73 m
bulatory p t nts 9 d d ot obtan r l f f m pa
S m f these ns t f ct ry es lts m y ha e b e n
d e to th fact th t the m d c t ion was not con
t n ed ccu rat ly th d sag was n t f ient
T lera ce t th s de e t usually de l ps
q te rap dly Thus llo s the a lges c f f c t s
tak plac

It is recommended wh n t rting th
dem ol f ambul t ry p ti t t start with
small d se usually 5 mgm for the first few d
u til th tende cy to r ct ns b des As soo
a poss bl th d g sh ld b i c ed t s
100 mgm very f r h urs Th eg m in an bl
g ve t f ct ry r sults reg dles of the type f
a thr t or the e ity f the pa Dem ol a
giv sympt m t c rel f of p in nly

R CHARD J BENNETT J M D

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Sh Inker I M V sothrombosis f the Central Nervous Sy t m A Charact r t l v cula Syn d m Caused by a P l nged St t f Va paraly i l h v P j h f Ch 945 53 7

As paralys s nd vas th ombo s of the ce t l nerv u sy tem are d cu sel i th s art cl nd 2 cases ith ev de ce of progessive d so der f th nervous system on a va cular ba a repo ted Aut ps s on these 2 p tients ealed b th va cula l s ns and cha g in n rve tissue p op r

The ascul les s consisted of ma mal dilata tion a d co gesti f the cap ll nes a d small They ere e g d and sh wed all the cha acteri tics of vasop ralsis Ther w als om deg e active h nge i the walls of th smaller blood es ls ad an ng eve to the pont f omplet necros th creased permeab lity f eous fl d and ed blood cell There w als m nife t t of ealy thrombo s and th lum of s m of th small em e c mpletely occlod d with bl od clots composed of c vel st an ls f f b r m l with la ge mas es f platel st a d white bl cells In these cases the ves el walls eemed to be w ll pres rve l xcept for slight lo of t nabl ty of the cellula elem nts

The cha ges otel p r ti e c s der d econdary t the c culat y cha g a l ns t d chelly f w dly d em ated r as f ft g volvg the cortical bbo nd th ht ub stance Th e v e o c s l sm ll d m t d foci in the white matte

The uthor consider that the ch g s as par ly i and va othr robo (h h a l t st g of the proc) sult from a sl gu f f c rebal circulat n in c ntra t t th ct l g cal fact rs in th ombo of a ter It t bel ved that a y change n the v sel ll is sa v i it at ng factor of th ombo s of the mall n

Mech c l fa tors in the blood t am f r g slowi gu p f c cul t r sult ac mulat f r d blood cells nd plat lets th th dual po d ct n f a th mb s Th tat f a p aly a soc t d ith xtr m d latat n f th small r ve s is the pr curs r of uch sta d f ll l by a cul r occl s n H B ~ M D

BLOOD TRANSFUSION

Ba k r \ W Crom r H E H rn M nd Wugh J M The U of Dicum rol in th Pre v tion f P toperati Th mbol a d Emboli m with Spec I R f re ce t Dosag nd S fe Adm l l trati n S gery 945 7 7

Th report is b s l n bs rvato f oo r g cal pat nts h r g d ma l [3 y -

m thyl neb s—(4 hydro ycoumarin)] i their im mediate postoperative p od for the purpose of pre v t ng venous thrombo s and pulm nary embolism The authors have found this drug effecti e in the p event n of these complications in p tient ho hav had nonfatal pulmo ary embolism throm bophlebitis a history of j revous thrombo s or embol sm and when this drug was g ven prophylac ticall no th ombos s or embolism occurred Dicu marol should not be used nless daily and consist ently comparable pr th omb n time t sts are made since without these it s impossible to be certai wheth r insufficient adequat ore cessi e and possi bly da gerous amounts have been giv n The authors bel eve that only the Q ick prothr mb n t me test should be us d for these determinat ons Cons stently comparable pr thrombin time tests de pend on the use of th omboplastins f constant p teney r on the checki g of each ne v b tch of thromboplast n with various dilutions of normal plasm It may be preferable from the standpoint of the cl nic an or surg on who i supervis g the dmi strat on of d cumarol that the r ports be g n in percent ge of normal pr thrombi rather th n i seco ds

The p e ienc of the a thors i the ooo ca es in wh ch dicu r l va us f has b n that with th th omb plast c s b stance wh ch as us d th omb s s o mbolism lm t c r taly dl not d cl p if the p oth ombi time a gr ter than t nty s ve eoo ds the time wh ch c r spo del t that of 30 per cent norm l plasm a d that def te bleed ng d not oc r if th p thr mb time as less th ixtys ond the tim hich cor espo ded t that of o per nt n rmal pl sma The authors ha adopted b taily th t y fiv nds th tim f 20 per ce t n m l pl sma s th k y po t i lec l g about th d age

D c ma o l s eff ctiv when adm i t c l orally The a thors h v e lca r d t smplfy th plan of adm i stratio s far as p ss bl in rd r to keep th p oth ombin le l betwe n 30 p cent and 10 p r cent of norm l f r ch i di d l patient and th y recommend th foll i g pla of age

The ent re amo nt of the drug f r ach day is g en a i gle lose Th e hundred mill gram are g en the frst dy nd 200 mgm the s co d day f w hund ed m l l grams r g en on each succed ng day th t th p othr mb in is gr ate th 2 per ce t of n rm l If it is l s than 2 p r cent f orm l no d cumarol is g n on that day

It m t be r mphas ed that d finite proth om bi def c ncy d e not d vel p immedately aft r the drug has be n g en F f ct e le els re n t eached u t l alter f om twenty f ur to fo ty eight h urs and somet me a c ns derably l ger tim

If b caus of hem rh ge r b ormally gh p th mb t mes t deemed adv bl t lo er

th p oth ombin time th s usually can be accom
pl h d by th tra sfus on f 500 cc of fesh c trated
blood It may be n e s a r y t tra sfus bl od sev
e l t m s o r a p r o d o f t h e d y s since
the e a t n d e c f th pr thr mb n time to
ne case agai aft r from t v o t s x h urs ha e
el p d

I th c urs f th s t ly m ad one b ulf t
u ally i a s g l e d of 64 mgm s l m t r d
n t r a n o u s l y to 37 pat t a n g hom
ces e l f e n c y f p o t h r o m b n h a d e c l o p e d
f t e r th a d m s t r a t n f l e u m a r l A l l b u t
pat n t c p n d s a t f a c t o r i a l l y T h e a c t u a l r i s k
f b l e d a s s m a l l a m n g p o s t o p e a t v p a t i n t
r c i n g d i c m r l i f t h m e t h d f l a g a n d
c o t r l m n t i o n e d p e i o u s l y i s f o l l o d I t p a t i
t i l a s m a l l a m o n g p a t n t s h o h a v h l s m
t h o m b t e r m b l e c l o s d

B y t o M H a n d T y l E S C o m p l i c a t i o
A r i g i n D o n r s i n M a s B l o o d I o c u e
m n t i j e c t i J M S c 945 09 4

A t u d y o f 4 0 0 0 j n o s h a d c l o s d t h a t
a c n t r o l l d b f p e r a t i o f r l l j o d u c s
a n l a r g d e l g b l t y t a n d a r f a l l i n t r s t h
i t h d a l o f 5 0 0 c c f l l d f r m n m l l h e l t h y
i d u a l o f r s n e r u p o t n t i a l h d

A p a t e l 1 0 p e c e n t f t h d n r s h a e
p e r e n d t n n t d c m f o t n t h r m f r m
h c h t h b l o o d s w i t h a n d a l u t 9 p e r
c t h a e h a d s o m e f r m d o f t r a n t r a c t n d r
i n g i m m e d t e l s a f t t h e d o n t n T h i n t a n c s
f l l a e l r c t i o n r s v c p e o m h u r s a f t t h
i n t i n r e a r e

T h c a d o v a c u l c o m p l i c a t i o n f r t d e e
f r t h n t h n r m a l c p c t a c y f r c c i d a t s f
t h s n a t u e n d r d t h n t d c t l r e l a t d
t t h t h d a l f b l l A p p o x i m a t e l y 4 p

n t f t h d n s p e n c d p l o g d o f t
m a n f t a t i t h b f h i c h m a y h b e a
d l a y d g n a t n f t h m g l b n O n l y a r y
s m l l b o i d l p d y m t o m f o r w h c h t h r
m l l a n t p h c a l b

W A T E H N A D L I M D

D G o i n E L I I m m n i t y t t l R h F a t r
C f B l o o d T r n f s i n R a c t i n J
L b C l M 945 3 97

T h e a u t h o p s e t s h t h t o r y f t h e o k
d o n i n t u d i e f t h g g l t i n n f a c t d e g r e d
b y t h e t l R h a d n t s t h t s o m d d l
w h o b l o d R h n e g a t w o u l d s e m t p s s
t h e p o t e t i a l t y f d e l p n g a n t i R h g e l u t
l y e t h e r o f t o m e h a m b y c i g b l o d
r e p e a t d t r n s l s i s f m R h p t e d r b y
l a r g c h i l d e n h s b l d R h p t e d

I p m t l y 15 p c t f p r n o f t h h t
r a c e n t h e U n t d t a t h b l o d h h R h
n g a t i t m a i g b o i l d t h a t t h d e l p
m t o f i s e m n t t t h I h f t u l d b e a
c o m n i t h e e n o t h g h t h r f t h t
m e c h n t l l y a l t h h t m b n t

f t h e R h p o r t c h i l d a n d t h e R h e g a t i v m o t h r
c c u r s i a b o u t 1 i r p r e g n c e n l y t p g
n a c y n 4 0 0 r e u l t s n h m o l y t i c d e s o f t h e c h i l d
I t h a s a l b e n n o t e d t h a t n o t a l l R h n g a t i
c p i n t s a r e i m m u n i z e d b y r e p e t e d t r a n f s s f
R h p i t i e b l o o d

I t p a t i c u l a r l y d s r a b l e t o o b t a n s o m p e
p e c t i c o n t h i c d n e f o m m u n i t y n a g a l
t r a n s f u s o n s e r v i b e c a s t h p r t o f o f t u s
f s i o n r a c t i s d u e t o t h e a n t R h a g g l u t
q u r e s p e c i a l l a b a t o r y t s t s p l i m a r y t r a n s
f u s o T h e m i l i t a r y e m p l o y m n t f m l t p l t r a n
f u s o s o f g o p d o r s t o r e c i p i t s o f a y b l o o d
g r u p w i t h u t p l e m n r y c r o s m a t c h a l s o n a s
t h q u e s t i o o f p o b l m o r t a l t y f m i o m m u n i z a
t i n t o t h e R h f c t o

T h e a u t h r d c u s e s t h e m e t h o d s f t h i n e t a
t i o n t h a t h a v e l d t t h e r e p o r t h e w t h p r e s e n t e d
T h e n i d e n c e o f e a c t i o n s i s n o t e d a n d c l a s s i
A s e r i e s o f 5386 c n c u t b l o o d t r a f u s w
t u d i d O f t h e s e 5 2 0 0 t r a f s i o n s w r e g i
t h u t r a c t i o n T h e w e r 86 (34 p r t)
t r n s f u s i s t h r a c t n s f l t y p e O f t h e s
r e c t o n 1 0 1 (8 p n t) w r f t h e c h i l l a d
f e r e t y p e O f t h t o t l c t i n s o f a l l t y p e s o l y
6 c o u l d b t t b u t e d t o s m m u n i t y t o t h e R h
g l a t i g n a n n i d e c f i p e e n t s
i t a t t t h e R h f c t o a s t t r i b t d t o m t p l
t r a n s f u s o i 4 i s t a n c e p r e g n a n c e s w e e s p o
s i b l n t h o t h T h e r e s i f f a l t y

T h e u t h r p r s n t s i n d e t a i l t h c h t o n f
t h p a t e t s s h o i g o m m u n i t y t o t h e R h f a c t
a n d d c u s t h c l c a l m a i f t a t i o n s i t a
f u o n r a t i s d u t o m m t t h d i f f i c u l t e s
i t e t i g f o R h i n o m p t b l t s e p r e s e t d n a
l c u s d

I n c o l u i t s t d t h a t a s r i e s f 5386
c c u t e b l o d t r a f u s n s s t u d e d M u l
t p l t r n f u s e g e n t r e c p e n t s w t h o u
g a r d t R h t y p e r t o b s t r c h i s t r y f e m a l
r c i p e t s T r a n f i a c t s o f l t y p e r e
s t u d d i e d c e o f s o m m u n i z a t i o n t h e R h
f a c t r T h e n d n c e f t r a n f i n r c t s o f a l
t y p e s i n t h s n e s w a 34 (0 p r t) I n 33
t r a f u s n s g e t o 2 m a l e s t h i d e c f i
r c t i o n s a s 3 (p c n t) I o o j f e m l r e
c i p i n t f a l l a g t h i n c i d n o f r a t n w a
39 (4 p c t) i 54 t r a n f s s T h c
s i d e r d i b a s t t t c a l l s g n i f i c a t d i f f e n c e
t h e s h c h m y p s b l y b e x p l a n d b y s o m
m e s i t y t h e R h f c t o r d l o p d u n g p r e g
a c y

I n t h e 86 t r a f s i o n e c t n f a l l t y p e r l y
6 e e f o u d h c h c u l d b e a t t r b t d t o s o m
m n t y t h R h f c t r a c d n e f p e r c e t
n t h 5386 t r a n f u s i n s I m m t y w t b
t d t o m u l t p l e t n f n n a t i v c e s a n d t
p r g n a n c y 2 T h e e s i f f a l t y f m t r a
f s n f R h p o t b l o d t a c p t b o h d
b e n s n t z d b y m u l t i p l t a l o s

T h r e 77 p t e i n g f o m t 3
t f u s l t h s 6 p a s s u f f i c t l

se utilized to the Rh factor to give clinically significant reactions. It is estimated that of the 399 recipients receiving 4 or more transfusions approximately 6 were Rh negative. Only 4 or 6 percent of the cwer immunized to the Rh factor by multiple blood transfusions.

The case histories of the 6 recipients with isoimmune reactions are reported. Preliminary crys m tching for the nt Rh agglutinin v uld t have pre ted all of the react s l eries f ncr as glv se ere reactio s i a recipient cannot be de pended pon a ad q te r m g of d v lopi g s s t vity t the Rh fact

H L R I T C STO M D

Self E B Thalblm W nd Sc dde J Pooled Human Serum A S g 1945 2 338

The authors p es t a rep on the admin t at f 297 u its of hum n serum to 36 l f ent pa t ents. Th y note that the c n ens s of op n n a p e rs to be that s rum i equally as eff cti e plasm although ass cated with a higher inc d c of re ctions. Th q ntity f erum administ ed at a singl injection by the authors r d from 50 c c f w babies to a max m m of 400 c c in a bur case. The t tal amount g ven in ev r l fus t patient as 585 c c. The ave ag dos of erum p e ca e as 580 c c.

The auth s descibe in d tail the 36 ca es h ch ser m w ed for shock du to k l t l t a ma shock due to hem r rhage operativ nd postoperative shock f the t eatment f b n septi c nd t s hyp p oteinemia and f pr phy latus. The cid c of re ct n s 75 p c nt for 244 t ansfus ns f m. Ther was littl dif f ren e b tween th ca tio at for the l q id nd th d ied pr duct.

Th f ll wing d d ct ns a e m d by the auth rs f om th t ly () fresh liq d erum ga e c s tently a 100 p c t chll fe e r act n at (v h t th to c factor is in fresh er m wh h d i p e rs on ag ng not kn n) (2) liq i l umpr p d by conc nt atio n cellopha e bags gave s h s er r ct n 3 f th 6 pati nts th t th mai g 7 bottles of rum ere n used (3) th chll fe react o c tit t d th largest gr up— 39 p e nt (4) th s s e ca tio v hich r q i d t p

ping of th serum tra fus n immed t sup port ve therapy, cluded which ccurred duri g admin stration of the concent ated l q id s rum.

In th s ries no fatality was attr buted t th g ng of serum. Re ct o s practically n er c curred in patients be g treat d for shock. The total r ctio rate cluding the fresh serum th co ncentrated l q id and the r w rked serum as 46 p e cent.

The uth rs emph ze that they beleve both pl sma and serum ha e a place in the tr atme t of p t t. Fr m th i exp ience plasm a d s rum ar equally eff cacious cl nally. They can be us d interch ng ably v ithout notic able differ c. Each posse es certain advantages wh ch the other doe t pos ss as foll s.

I plasm () there i a lo incidence of re c ti ns () the c s gr ater y l d (3) plasma con ta ns fib i og n and pr thr mbin and (4) it i m re asily i ref a ed as a by p oduct of blood b nk.

In er m () th e is g eate p t n content nd p ols conta n 7 gm p r cent as compar d t 5 gm per cent for plasma () the e p e s and trouble f t te i obviated (3) crum can be filt ed h nce b ct i l sterility can be assu ed (4) l q id serum r m ns clear while pla m (u less ealc f ed) pr ipit t fib in and (5) d y s e s er witho t the p esence of c trat.

In co clu on the a th rs n te that pooled h man s rum i a effect e blood substitute. S rum i min st atio n s s ociated th a def ite i cidence of r ct n great th n th t ith plasma. In the rex p rienc fr h s rum p e pa ed and in j ct d ith n twenty fou h urs f the d w g f the blo d ga

ev e chill and fev r spon e n each cas. Serum i n w being pr r d at th. Pr b t rian H p tal Blood B nk to me t th n d fs ppo tve th p v n pati nts with l w pl sm pr tei s and lo v cal c m. Mas v r plac ment w th s rum rath th n ith citr ted pl ma theoreticall is afer in such t t p t cula ly in fa ts. The r ct on caused by ith s rum pl ma e rarely se re the ch ice b t een th m b comes la gely a quest on of co e ience as well as p eticabul t f p eparat on a d adm i trat.

H L R I T C STO M D

SURGICAL TECHNIQUE

WAR SURGERY

lea ll B S A ut ll at F ll e ll w ll g
Bl t Injury W M d Ct 945 7 6

In 3 ca es appar nt co g tiv h a t failur f l
l w g blast i jury \ s b rv d n p t nt \ th
p e iou ly no mal h art Thirty f e th r pa
tients with bl st injury were stud ed f m a car
l vascul r vie poi t T o of th se had abno mal
v s pr ss res th t b v us c use an l g add
t onal pati nts ma f t d def it electr ca l
g aphic ab orm l ties

Whe as at the pres nt tim n l quate e pl na
ti n can b off r d for th e b rvati s the pr b
lem i orthy of furth rstu ly snc it uggest that
he pulmon ry ed ma de el i f llo ing bl st n
y l g tal at on nd ne ect n may b i di
c ted J V J M Ato xv M D

D ck I L Tl Ma agem nt of M Itipl I Juri
in Alrc w L d b gh M J 945 5 61

In an a tcle l ing vith rc w ca ltes th
auth d cus es 3 typ f i ju s () gunshot a l
m le w unl (2) l ur (3) fractures a l
fr ct r d l cati

The first g oup relat l in gnt cant nec it i
nd stingu shabl fr ms mil injuries infl ct d und r
ther e cum ta ces Wh t smore t fact rs ar
pp ciably to les ng complat ns namly
ffc t ly t atment and ab ence of gr c
tam t n of the ound

Bu ns const tut y pe al ed problem l r
t cally al av th pr tected ha d a d fac a
olved Wh n th se burned a eas do n th l ap dl
with m n mal cont ctu e s ious l ab l ty en ues
l cr ed f bro a d co eq ently gr at r nt c
tur a a l r ct s l t p l ged g n l t n Th
l obl m ther f e n th t atment f b rns of the
h nds nd f ce st c tr l n ct on and t repla
l st sk n thout d lay M e v e f c to of th
h d mu t be p ved It ften happ th t
y nts a e ope el d te d d stroyed h ch i
l es prolonged gr nulation M a ures m t l b
taken to p t imp ment of th fu ct o of th
h nd by p e nt bl c nt ct

At the b gnng f th s a th ap l cation f ta
ica d oes me th f m f coag lant s almost
i r lly s d n th t atment f bu s While
th i st ll ad q at t tm nt for m ny types f
b rns it p es d t u n th treatm t f burns
f th hand nd f ce The agul t tr tment of
l r lep nd f fts ecess on the m nt n nce of
t r l c lto is u d the o gulum Th n ly
can it b ed th tcau ing h rm In b rns of the
face v n th utt e d struct s m d g ee of
i sect n m t cu nd t atment must b d ted
to st c nt l l n th d l g b f th f ce and
j j c tr ll l f tio l ble p rt f

the h al gpr ~ w th t it loughs para
much m l ly Alth ough nf ct s rves a us
ful i u po e while th slo ghs a parat ng it m t
be l m t d at the tage f re ep h l z at f th
bu n Fp thel m ill g ww th am g pe d d th
b ta l s to t gr tha emo ed Th e bstad
are inf tion nd r gul gra ulat ons

To b ns of th f e the uthor r comm d dal
al n ig t f pos bl i a al e bath i
l ess gs f ulfo m d p d tull gras a d a
l e p cks unt l ev ry l gh ha s pa t d As soo
as infect on u l c nt of th remain raw ea
are cove ed w th a spl t k g ft This minimizes
contr ct re and the eed f sub qu t plastic
par P ticular c mu t be giv nt the eyes n
ntr ct r nd th yes causes exposure of th
corn This in th p es ne of infect on res l b
n lule r t n with l f the y In all cases
wh h th eye a e l ed pen cillin is now instll d
to th conj nctiv l sac th s s v th ey wh h
ould otherw be ne tally lost

The rules g v n the t tment of b ns of th
h nd ar in vact ac d th s gical art pna
ples They a contr l i sect o p omote h lag
p nt c t ctur d b e all preserve f
t n II d sh l l bet at d th d l w l n b th
a d th s l f n m le tull gr d sal p k
ban lag d n th t th f g rs an b mo d and
e c d f m the l g n g t p eserv th f e
tion S t ated th y n d t becom st f f Th
gr l at ons a e co red ith pl t l n graft
oon as i d cat d t m p a y d o t
f g mo m tal c mp th s in graf
g of a bu ed h nd Th d to the immob l a
t n wh ch must b estab l h d in rde that th
g f t m y tak It i n come h v
th per d f m m bl z t does t e d fou
fi d

Wh n th burn d stroy s tend ns nd p j t
a th r c n d rat on mu t g u d th eo n h
treatment S r l m t tion f m m r t r e h
f om bur of the d gr nd wh t mo em nt e
m ns m st b f l t ted by th f nct o l po so
f the h d a d t h d d by pr tabl
tr t c The t t te that in the R val A
l c t l ha d e s lly b ned worst the d
s m nd th h ct tic co tr ctu e of se
burn f th d rs m of th h nd f s th m t ap po
ph lang l y t hypere t on O ce th s co
tra tur h b c m f bl h d th r s o k n
means f resto g a y f ncti what oe t h
affect d d g ts Th a r bu ns f t p lmp du
flex cont ct e h s qu lly d abl g Hand
th u g a ely bur d m t b spl nted pr ferabl
pla te the best fun t n l po t u th th
met poph l g l y t n m d a n, til
fib u a k l urs Th p t nt i e co
t d l p ch mov m nt f th h das p bl

It may not be mch b tft u flmoy ment ith
regard to functi n— In the pathetic sicker of a
subluxat d jnt

The third type of injury fractures and fracture
dislocations differs widely from the stereotyped
burns of a c e s i its enormous multiplicity and
extraordinary variety. In the of the force producing
these injuries the terrible stresses machines a d men
are subjected to n a i craft crashes and the speed of
impact in these crashes (which is s ldom less than
100 miles p hour) it is not su pring that mor
th n one injury i th same pat ent is fr quently
found. Se ere displacements a d compound fractures
are common. Often head jures dom nat the m
mediate picture and d lay the treatment of oth in
j ries. St pendous and multiple as these injur es are
two factors help g e tly in the treatment of a rrew
ca ualt es namely, the f ct th t thes injuries occur
usually n young fit men whos morale is h gh a d
the fact that these i jured usually come under treat
ment within a f w hours. Thus combination of
j res can be treated succes fully h ch might under
th circ mst nces pr e fat l

The treatment of multiple jures is div d nto
t phases the immediate and the definitiv or
n remote. The mmed t phase takes ca e f
g eral cons d rat ns consisti g m ly in the n
trol of sh ck nil cal consid rations consisti ng in
the p event n of wou d fect on and the pr mry
reducti n and splint g f fractures. Fr ct es c
cupy a very eco dary pl ce i th mmed t pha e
a d must n t be g en d e mpha. The d fin
or remote tr atm nt concerns t elf th th
man gement of s nd healing th repl cm nt of
skin los and th accurat real g m nt of fractu es.
In this phase all poss ble methods of f ct tr t
ment should be ava lable. Frequ ntly a pogr m f
uitable tre tment of an ind rd al jury m t be
d sca d because f una o dable del y in sta tng
it infectio th r injur s n the ame limb r
l ewhere

Immed at tent on m t be g n t hock
hich is on f th most t ea h r us n l e c tful
c nd t s lly impo tant to mph s e z th ca t on
that s e ly sh ck d pat ts h uld b lft d and
m v d as lttl as pos bl. They h l d al be
tak n f om the ward to the t n b l d t
troll y. O el f f om the bed to the tatl ough
and th y h uld be lft d th cruy lou ca a d
g nt es. It is lke s ipo t t that rely
shocked pat nt sh uld not n es l b m lto
hosp tal as oon the a e cen t the t f the
ceid nt l t a erf p t nt t tand a h t
journe t a n sb jla e f h l t h he can be
g pl ma nd blood d lft t c r ntl
b ltt m e f rth f h ma l n th
mbul n f h t k t ght n a h ur
j n y
l t t f l ock s be j t l l f
l n th f m a e s t r t th n l l
um f th c tulat g b l o. Th t r t t l g t
blood prev u r dng n l t begi pl sma tran f

s i n The blood r s r r a l g i n a l e t e a
a lase l n against which further read gs can be
compared. Bl d pre ssure read gs are the most
val able indicat ion f the degree of shock and the
effect of resuscit ation. Reliance cannot be placed on
one blood pressure read ng alone. An accurate esti
mate of the patient s cond t n demands a close fol
low up to det rmine wheth r the blood pressure is
stati nary r i g r f l l ng. There is a stage of vas
constrictio n shock when the blood pressu e is high
and sudden nd d mat c alt at ons may occur
without warn ng. Tra fus n the efore is started
immediately for once th needle is in the vein shock
is l gely under the contr l of the surgeon. Plasma
can be u ed with ut any typi ng o cros smatching
and is as efficacious as blood in esto ng the blood
olume in the init al stages f resuscit ation. In the
stag of hemoconcentrat n tran f sion of up to 2
p ts of pla m n t only r stores th blood volume
but brings g n into act e use red cells which were
stagnant i d l t cap l l ares

For ma s i e t ansf ions it is not desirable to us
plasma s nce (1) a t ansfu io of mo than 2 pints of
plasma causes hemolult n and then plasma be
comes much less ffective in controlling shock than
whole blood. (2) the administ ation of large amount
of plasma is foll wed in t o o th e e eeks by a very
toublesome d int ctable s cond r y anemi
(3) l r g am unts of blood are lost into the tissues in
closed f act res thout any xternal bleed g. Th
f r ample f om r t 2 pints of blood may be
e trasvated into the muscles of the th gh in the
presenc of closed fractur of the femur

For mas i v transf io s blood is us d. Th r e r
4 l nt transf sions a e relatively common. An em
pirical limit must not be s t to the amount f blood
which should be g en to a y pat ent. G ave injuries
n wh ch there has b en a he vy loss f blood s me
times d mand up to o and 1 pints. After the blood
transfus on s begun the bl d p essu e should b
eco d d and charted t fifteen m nute int rv ls o
that sudd n det r or ti n f the pat ent s cond tion
may not cape e gn tion. Th s can be done while
prepa at ns for ope at on r in p r gress and can be
cont u d v r y n or even fiv minute du ng the
perati n. Th m d cal ficer in charge of th ca e
must k l most r ful atch s that any sudden
dr p n th pat ent cond t n m s b promptly met
by p d ng up t t n f n

G eat impo tance atta bes t the a esthetic and
t the method of ts adm nistrati n. The anestheol
g t l key m mber f the surg cal team and the
cr iu gment an l g r e car must be exerc ed b
him in the p oced e. Sp l an l gesia sh uld n
be l n the cases nce t p d ces d op i
blood p es u e nd ne its f fct nce establ h d
n t ally rsbl t is too l g u
Local a sthet cs a usually v l d by th te h
n c d f ficult y f th n ltle f l t at eed i
and by th pot nt al or tu l inf t f th
nd. Someti mes h e er r g n l l l ock m
be s d w th ad antag. Ga a doxyg ng en ly an

pert with pec l care to v d any inc e n
t: sue an j s th b st me ns of ma nt in ng a s
thes A ltl th r cyclopr pane is added if
nec ry

The most imp rtant object f the mm d ate local
tr atment of pat ts w th m lt pl j s th
c nt ol f infect on Th fl ct d by caref land
the ugh exci on of wou d and the preventi n
f lin necros s due t gross bo y d spl c m nt

A t fractures and fractu di locat on th im
m l t tr atment f these nju es call f rac l n l
reduct f the displac ment so that the sk i p c
ery d and the c mpl cat on of ps s n t added to
th e tngles n Almb n h h th e a f e hor
a r c ntly m n p l tel fractur o a r cent wou d
l th r to acc l t r to op atio must not be
ncl clin compl te plaste Th pl ter sh uld be
spl t sent l ngth a d the d sings and r t spl t
do t the kin th tractonary s ell ng ca n t
ndanger th blood uppl to the limb

Th d s n t e t tment f n j r e s can b gn
h n th pati t h r co er d f om shock and h s
g al ond n a r a s t When ther s n skin
los o nd of lmost a y size ll heal th r mark
abl rap d ty and r a cl i pl ter if infection is
ad quat ly c ntroll d Cr nulation s n fl up any
dfect in a properly ve ed w und and sn l healing
o n fl s f infect on r s t s n ch a w nd it
is d e th t i d q t l i ng f the w nd
and con c j nt pocket g t s qestr t n of in
fect f bon to r a n d f r gn b d Th
ou d th n n d fu th r pl at i th pr is on
f r f e drainage a d th r mov l fa v f r gn body
r sep a d q est um

Wh skin has b m l t the pr cedure i differ t
Any t e los under th skin i made good by
gra ul t ns h ch fill th d f e t s nd c nt act into
a h m ca but unt l the gra ulatio t sue is co
er d w th k the wound n th l d To pr m te
rap d heal g of a w und the s l e s a i the
bur the c ntrol f infect n and the r placem nt
of lost k by a k n g ft U u lly quite mple
form f sk n g aft ng a suffc nt Ep th lum will
g w er only f l t n f cted gra ul t ns The
wou fsho l d b c e d e npl ster u t l th g nu
l t i a s l h w th e f r e s Th th r a
is p p red f the e pt f skin by ctly the
same m thod that sed n th r tment f burn

The t eat nt of bon a d j nt inju fll s
the d ary m thod In r r in j s th
ty and mult p l cty f def m tie r f t n t e
mendo Ma i e b n g ft are often d d to
r pl c lost b ne r t p o de te al f a t f r a
fr tur f h ch the l gment l d ot be
tr lled by xte n l pl t s nd v h h co l l t be
tr ted by ealy pe at be us of a w und A
bo e gr ft s sent l for th first f th t o pur
p ses d it is much bett tl a m t l pl t for the
sec nd it p om tes u i add t n to pr d ng
intr al fixati of the f ctu

A mmo typ f j r y nai f t e f
the s f n Specib a h mu t l j b m d for

injury to the vertebr l col mn alo e or s a a
ciated les on i pati nts nvol d in aircraft c hes
even wh n no c mplaint s mad f pain the back
Alb the spines of p t ents with f actu es of the os
calc s r st agal s no matter h w they wer i j t
should al ays b amin d s a fixed rout ne s e
pa the foot often mask m n mal discomfort in
th b ck Th e may be an ob o u gros d
d am t c n j ry el where but the sp n e f pat t
injured by s v e v ol nc must al ay be xam d
b fo a ur e of treatm nt pl n n d

M t m J S E T T E M D

Ros J A R mo al f P ojectil Fragn t s ad
Imm biliz ti n f Wo d B t M J 94

31

Immobiliz t is a e trem ly important part of
t ansport t f the w u ded Gu h t w d
of th v r t bra sho l d be imm b l d i p d d
poste ior shell I fractu es f th a tabul m nd
uppe th d f the femu a Wh tma plaste cast
sh uld b applied Com pou d f ctu s f the f b
sh uld b immobiliz d plastr c a t w h runs
ll bo th kne P e trati g perf rating
u ds f the f t should be mmobiliz d i pl t
ca ts O e h u dr d p e c t of all ompound frac
tu s f the os calc s arri n i S th Africa
quired amputation Wound of the ist d f
arm qui padded pl t plater ca ts with im
m b l z at n f the joint bo e nd belo th t
of fractu e Wo nd f j n tve eq umm b a t
ti Ele t n o f a e r t m v e cl ed in plat
cast cut d n mate ally upon ed ma d constric
tio On the ther ha d e ess e pluntin ha
don m ch ha m by cau i g stiff ss f the j n t
f th h nd O e w d f caut o must be g en
whe exta emit a e put up in pl ster casts
spl t ga ga grene m st lw ys be thought f
a po ble complicat n

RICHAR J B N E T T J r M D

Byrn R A Th Heali g of Wound i Ne
G i ea ll M d Chu 945 7 8

f fty cas f su g cal wou d r stud; d j t
r p cal c d t i fr m the sta dpo t f the
mal h al g i o d i the tr p es Of th s
u d 4 we e nfectd In 3 f th i the m
se t n n as du t a bre k n g cal te h nq
In cas th e s b u n i n t i a d e
wou d The peratons we perf m d t n d
va d nav l base h p t l d typcally trop cal
co d tio s The pr at oom was e posed to dirt
and d t but t w s comp rat l bug p oof C t
t utu w r u ed in llec p ca e
pe c b h that the e t th t s e s
c f m m t th n m l heal n p ces b
c t t r th r th u gical gut i u ed Care
h dl f th t a c d e red f th g t
t mpo ta d r y f f t a s m d t prot et
th m l th ca t d d th a e d r e
h ch ug t d th t l a n w und don t heal w
in t op cal c m t J n r J M a t o r y M D

White J C and Seville W B Trench Foot and Immersion Foot *N Engl J Med* 1945 23 45

Ever since the epic retreat of the Greeks under Xerxes across the snow-capped Armenian mountains, frostbite and related injuries to the feet from cold have been reported in the literature. Cold does not necessarily produce a single type of injury but a wide range of results in several distinct syndromes which become most important when clothing, food, heat, and shelter are likely to be inadequate and when a great number of soldiers are exposed to the rigors of outdoor life. Wet cold is far more difficult to deal with than the more severe degrees of dry frostbite as found by the American medical officers with the troops in the Aleutians.

The treatment of trench foot and immersion foot—both caused by prolonged exposure to the dependent low temperature to cold and moisture. The knowledge of trench foot acquired from army surgeons who attended many of the Aleutian casualties of this war and who have made the data and critical material available. The immersion foot information is obtained through personal experience

with survivors of torpedoed vessels who were exposed to cold water during a prolonged period while drifting in the North Atlantic.

Survivors in a crowded lifeboat are forced to sit with their feet dependent and immobile. This also produces edema and frostbite with its hypoproteinemia and added factor the edema itself is pronounced with uterine cold. Occasionally when a man is forced to kneel or sit for prolonged periods on the bottom of a rubber raft the same conditions seen in oiling the knees and buttocks. In the Aleutian landings men were forced to take cover in foxholes.

As semistagnant air from the tent fourteen days in military life by day and light fogs at night. During this period they had to eat what we called "thoroughly" and had no opportunity to change footwear. Under the conditions all the cumulative cases leading to tissue damage in a crowded lifeboat are present—exposure of feet to cold just above freezing, extreme dependence and immobility, and a general chilling of the body.

Immersion foot and trench foot differ from frostbite simply because the tissues are not actually frozen. There are no ice crystals in the tissues above the freezing point of seawater and the thawing

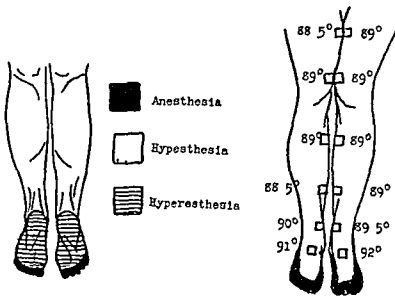


Fig. 1. Sensory changes in trench foot and immersion foot. The diagram shows the distribution of sensory changes in the feet and lower legs. The shaded areas represent the distribution of sensory changes. The legend indicates:

- Anesthesia:** Solid black square.
- Hypesthesia:** White square with a black border.
- Hyperesthesia:** Square with horizontal lines.

 The shaded areas are primarily on the feet and lower legs.

T
R 80 88.5 88.5
L 80 88.5 89
Room 7 5

[illegible]

Car f l o b e a t i o n s t d e a t t h t a m p u t a t i o n
r e v i s i o n t h r o u g h t h e f e t a b a k a s t h e t r s m
m t t a r s a l p o i n t s h a v p v d e d a s t f t o r y f u
t i o a l r e s l f o r s t n d i n g a d a d q u a t e a l k i n g i n
s t n d g t h e p e s e r v t o f a s t a i l t a r s t a i
t h e m e c h a n c a l a r h e s f t e f e a t a d l g a m n t a n s a i
m u s c l e s a c t b a l n c t h e b o d y w e i g h t o n t h e t a r
a l s F o r w l k g m o b i l i t y t h e m t a t a r s p h a l a n
g a l j o t s i s e c c e s s a y f o t h s p r i g k e t a k e f f o
a c h s t p T h e p r i n g s t e l l i n g t u d l s t i p i n t h e
s o l e o f t h e s h o a d t h t r a n s f e r l e a t h e b a r o t h
s o l e f t h e s h o e p l a c e d i n b c k o f t h e d i t a l e d f
t h e r e v e r s e d m e t a t a r s l h m a t e r i a l l y i m p o e d
a l k g l i t t e c n c n t u a l c a e a d h y g i e
o f t h f e t s h o u l d b t r s e d

OPERATIVE SURGERY AND TECHNIQUE

POSTOPERATIVE TREATMENT

La ge a eas th t have bec de ply burned sh ld
b co er d with epith l um by m a f ki grafts
t th e rliest opp tu ty It is ces a y h w
t wat t l hock It t n m b l t t

fluid elect ly balance al functi n d ma
nd t xema h e been cont oiled Al o t is de
able to d la th graft gu t l th p th l m has
been rest r l po taneo ly to llar f cond
degr burn T w it for ep the l zat n of la ge l l
th ckness def ts ho e er even th ugh the c n
ta m l l abl p th l l l d that e ntually
might p ad to c er the rea i usually u i
Gr ft ng h uld be d n early eno gh to vod th
pe d f d b l tat n ften as ci ted w th th
p ese c f la g gran lati g are s s v ral eeks
after a e ere bu n M ntenan e f nutriti with
part cular e f r nce t a d t h g i pr t i and
vitami C i t al espec ily if ea ly sk n g aft
g i c ntempl ted

It i difficult designate an exact time th t ill
atify all of thes requ ements Surg cal ci n
sh uld be do e in a fully equipped per ting room
p fer bly at some tim bet een the cond an l
th l e ks f ll w g th burn The pr c d of
etc io f bur ed ti ues and early sk n gr ft i g
m v be s d b th f r b r ed patients t e d i i
ti lly th comp es i n type of d ess g and tho
p n homeoagulm prod ci g dr gs uch as tannic
c d ith l e nitr t r the dyes r u d Ag n
l nesth t c is r q ited

Th bu ed area nd su und g lin rect ned
tho o ghly w th a d t rge t l t on d d ap d
w th t le l e Th p oposed don r a a
prepar d im l r l but s pa at ly All cr t c
t su s ci ed a much ablet e ben g p crv d
a poss ble Th di ctio difficult d slo It
s p eferable to apply kin gr ft at th same ope a
tio f the o f i n of the pati nt p rmits b tocca
i n lly it may b ces a y to delay f r a f l y s
b f re pl ing the grafts at cond p rat Sk
gr fts f l t rmed te th ck e r r mo l fr m
d r sit i g th l ad tt Blair m th l a d
re fix d t th d n d d a ith c t t n s t es
If th a ailabl d n ste do t pro de n gh
g ft to cover th d fic e t a ea completel th

g fts a e cut t sm l l q ares (post
f om 1 5 to 2 cm s ze and are plac i n
ne an th r s is pos sible ov r the entir d
they a e not sutured D o graft d re r
ered th a s gle l ver of fine mesh ga z e
n ted th a g s ba e co tan g a l l
e p t c tment and luminou c mpr
in are ap l d In children or in dults
near joint a light pla t r co g may l t
r the ompre si nd e g If po t l t e
l d es ngs ar left in pl ce for t eeks
the graft g p oc lure if it bec m s n
m ve them ea l r the pro edure sh uld
red out i the p at g om nd cor
dres g shoud b reappl d t once

Appa ntly ea ly gr ft ng of sk f ll g
te s de l b r s m n m z s c tractu a
formity S m p tients v ill d o add t
c dur but others v ll requ pl stic met
contract res that have r ult d in sp te for
g ft g To such pat e ts th ea ly closure f
w und by th appl cat n of g afts f i t e
th cknes probably ll permit ea l plaster
J V E K A TR X MD

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

W l k r J M d H m l l r J W Th l m
me t of Acti n myc l with P l l l l l
S g 045 t 373

I 6 c s f cti omyc f rabl esults
btain l w th p c l l n th raj alth gh th f f
up p r d ar t h r t t l i m p e m n t e
l o l n g e t atm nt u ally f r f r m s t
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Th auth b l that a c mb nation of p
lin n l ulfo am t might b employe t b
tax a d st s th ne s i ty f a l x i
n d l t t penicill n whe th r m a i
f b a d s r n g W r H N A L E S MD

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Leitin J and Weyrauch H B Acute Obstruction of the Colon *Am J Rtg* 94 53 3

Acute color construction due to the color of
olculus presents definite distinguishable
general characteristics which permit an accurate
diagnosis

In malignant lesions of the sigmoid the rate of tumor growth is slow and permits the bowel to adapt to the tumor. It maintains its tone and elasticity. The back pressure dilates the cecum and the ascending colon.

On the other hand, a fulcus of the sigmoid is a sudden twisting of the intestine loop. This closed portion rapidly becomes distended with gas. The outlet of the bony pelvis is at times reached through a phragmatic loop.

Nine case reports with film and 1 e d a g
 illu tr t g the vi w of the auth rs acc mpa y th
 a tele R A B G M D

Imp F H X R ys in Diagn si and Localiza
tion of Gas G ngr n L t Lo d 945 48

In the present arsenals of gas gangren have been far fewer than they were in the year 1918 but the disease still remains one of the principal causes of death from wound.

War Mem No 155 issued by the British Army
1943 gave the following symptoms and signs of gas
gas poisoning as follows:

1. Increase gain in the word a e with po
sibly the appear c r increase of c swelling
2. A i g u l e t in th ab c of cont n ed
hemorrh g nd ft shock ha b n o rcome
3. A change in the m tal attit de of th p tient
h b i d i l t to def n ith accuracy th s ch nge
may be e f i mental p thy or s met mes upho
with or without estless ess

4. A o nd which is rel at vely dry r at m t
sh s a th n d cha ge the xpo ed m l nd fat
at t mes being st in d a plum col r f m h m ly
Occa nall n pl ined att ch f om t ng
may occur the ea ly st ges

U f r t u a t e l y n t e f t h e s g n s a l o n
f f e t l y d t i c t i v e a d f l l a e p e n t t g t l e
t h e p a t i t c o d t n i s l r a d y g r a v S o m
m t h o s s q u i r f r e a m n g u p i c u c a s e s
w h h w i l l e s t a b l h a n r l y d a g n o s w t h t h s
m r d c t i n n t h f a t l t y t m i g h t b e a h d
T h u e f x r a y s i n t h d g n o f f g g r
i n o t j u s t a m a t t e r o f d e t c n g g a s f t h e a
v e r a l c a u s e s t h r t h n g g a g n w h c h g e
r t t g a s i n t h s f t e s

All fresh water in the country is put under permit to enter the States sometimes for exportation may be let out locally or bibles

may be seen in the depths of the wound but in most cases a is not observed unless the part is completely photographed. Air may extend throughout the entire length of a limb but it never infiltrates the muscles unless it is forced in under pressure. The amount and distribution of air in the tissues vary according to whether the wound is open or closed and with the amount of tissue which has been lost. If a wounded part is not mobilized its elements active pass on to tend to such air to the tissues.

I on of the authors ec nt ca s a roentge o
gram of the chest showed gas out ing the fibers of
the pectoral ma muscle on the left side as well
as ell marked s bcuta eous emphysema in the neck
and the left arm The patient had a small pe etrat
ing wound of h s chest in the pecto l region and
with each b ath he could be seen to blo v air fr m
his chest into the pect ral muscle The centgeno
graphic p cture of this m cle was very like th ap
pe rance g en by fulminati g g s gangrene

Once the injured part is placed completely at rest
a rhythmic absorption bed. In twenty-four hours the
most intense is considerably less and within four days all
but a trace has gone. The rat's absorption seems
to vary in different tissues being quicker from
muscle and synovial membrane than from
tissues. If the tissue is dead there is no absorption.

Many other factors in treatment may influence the roentgenographic picture. A can be introduced by changing a pack removing a stitch or by irrigation. In one case x-rays showed a great deal of air which had been introduced, tho't the surgeon's knowledge during the manipulation of the instrument was usually peculiar. Soft paraffin gauze tends to compress the absorption of air and holds it in place in the skin in the hand. When the use of paraffin gauze has been led off from the pulpit do not usually look for air into the tissues but a subsequent operation may permit it to enter. Thus the treatment adopted must be considered with the use of the surgical fluid gas bubbles in the tissues.

Local form t n f gas in the depths of a ound
by g s f r m g r g n m s g e a roentgenographic
ppearance whch clo ly resembles that g en by
ir As rule it i mpos ble to diff r t t t this
g s f o m a c c p t b y seral roentg nograph c ex
m att ns and only th n f the observe is ac
qua ted th ll the details of the pati nt treat
ment s b quent t h accid nt

Local gas format on does not necessarily mean a on of the lung tissues by organisms for as a rule the bubbles in a hematoma are intraf body in dead tissue. In such cases there may be clinical signs of infection and the centogenographic signs do not in themselves demand surgical intervention.

It is very difficult to decide when gas farming or ganymahabgun to make the loose cellulose

in the early stages of the disease. As to the prophylactic author suggests a surgical preference for radical resection of the cancerous lymph node metastases are found as these can be taken care of by postoperative irradiation.

All of the 9 cases were treated postoperatively with x-rays. The results were very encouraging indeed as compared with the high mortality rate reported by other authors. Six cases were cured permanently, only 3 very advanced and inoperable cases terminated fatally. Most impressive is the report on an inoperable epithelial cell sarcoma in a man of thirty-three years. A total dose of 550 roentgens was given in 10 sessions (series 1-4 250 roentgens during fifty-one days and series 2-1000 roentgens during fifteen days). The patient recovered as far as symptoms and ability to eat and occlude half a year after the operation. Plotted in connection with a later appendectomy for cancer of the stomach to be free of many tumors. Operable cases are treated with gastric resection and postoperative roentgen therapy with daily dose of 25-300-400 roentgens with a copper-0 tin filter from 50 to 60 cm focal distance and a total cutaneous dose of 550 to 3000 roentgens during four to six weeks on each of two anterior and posterior fields. Supplementary series were given in two or three months later in some cases.

Preoperative roentgen treatment is desirable and would probably further improve the results but in most cases it is hindered by the difficulty of the diagnosis.

Many cases of sarcoma are still often wrongly diagnosed as inoperable cancer on the basis of a pathological report. This is not to be edited by the additional up to possibilities. Therefore biopsy should always be done in cases of operable tumors.

W. ERM. So. M. M. D.

M. Takali S. Ca. Clin. M. of the Larynx and Hypopharynx. Roentgen Treatment and the Results of Therapy. (U. B. D. Larynx and Hypopharynx. M. H. E. Roentgen. B. H. D. G. D. E. Roentgen. D. Th. Rap. E. A. T. D. I. St. H. 944 5 3)

The material reported by the author comprises 38 cases of carcinoma of the larynx and hypopharynx treated at the Central Institute of Radiation Physics in Helsinki. Land since the foundation of the Institute in 1936.

The author divides the patients according to the location of the primary growth in the larynx and hypopharynx. The most commonly used by laryngeal surgery and the first results (1) because the extent in most of his patients was already so far advanced when they came under his care that it was often difficult to possibly to do the exact point of origin of the disease. The type of primary growth in the material with cancer is so important in irradiation treatment.

The classification of the cases according to the location of the primary growth in the larynx and hypopharynx is as follows: the free edge of the epiglottis, the aryepiglottic folds to the aryepiglottic ligaments in the back.

The difficult cases of classifying these advances in form of cancer caused the author to create temporarily a third class or group of these tumors consisting of tumors involving the epiglottis and adjacent area, excluding cases of cancers of the base of the tongue. These cancers he designated as cancers of the anterior wall of the larynx. This group exhibited two notable characteristics: (1) 70 per cent of the metastases to the region of the neck when they came under treatment and (2) they were found only in male patients against 3 females in the group of 30 laryngeal carcinomas of the hypopharynx. Tumors occurred in women. The absence of females with this type of tumor and the paucity with the two other types of throat cancer is tentatively explained by the author on the etiological basis of this type of cancer, namely that it is Finnish women do not smoke very much and the Plummer-Vinson syndrome is extremely rare in the women of Finland. Another justification of the existing classification of cancers of the anterior wall of the larynx although many of them probably originate in the hypopharynx lies in the fact that they more selectively resemble the true laryngeal tumors in their response to irradiation treatment. For example, of the 130 patients with laryngeal carcinoma, 38 died five months or less and of these 9 were free of symptoms (a cure rate of 24 per cent). While 77 patients with tumors of the anterior laryngeal wall died for five years or more and of these 12 were free of symptoms (a cure rate of absolute cure of 43 per cent).

For the purpose of evaluating the results of treatment therefore all cases of tumors of the larynx including tumors of the anterior wall were treated together as cases of tumors of the larynx to make a total of 238. Seventy-eight of the patients were living five years or more and of the ewer cured a rate of 38 per cent while of 37 patients with hypopharyngeal cancer, 17 were still living after five years or more but only 1 of these could be classified as cured and absolute cure rate is only 8 per cent. Even so however all these cases are considered together with the 121 laryngeal cases, the cure rate of 38 per cent. The results compared favorably with the best results of surgery when one refers to the following figures showing that 87 (7 per cent) of 174 patients free of symptoms after five years of living various operations for cancer of the larynx.

In the attainment of the above results not really large dosages were employed in the treatment which as almost exclusively roentgen therapy. Stable application of 4000-4500 rads of 40 cm filter (Thoraeus) zeiss field 6 by 8 cm, 18 by 18 by 18 cm. Most frequent

To understand the rat onale of the t eatment it s
neces ary to explode 3 misc ncept ons (1) that
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d rect seq el to irrad at o but a r sult of the inad e
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of the c lls in all thes instances) (2) that t ss e
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the radon is l than e one hund edth of that fr m
the alpha ray) a d (3) that the ointment n th
str ngth ued h no eff ct on a m lgnant les n

It is the authors impr ssion that th alpha rays in
sm lld scs stimulate a d prom te the growth of vas
cular epithelial t sues Th e may b a parallel in
th effect f e ysm lld e froentgen ray in the
tr atm t of inflammat ry lesi ns

The authors p epa e th ointment by br aking
dinary d n e d (1 cm lo g and ith a 0.5 mm
g ld wall) in a jar f hot vas line (melt ng at 44 C)
Mix g i pe formed by m lting and shak ng after
th jar has to d f twe ty f ur h rs The con
tents are tested f unform ty of d tr but n by
f ol sc nce the d rk and the cti ty i check d
by measurement f the gamma rays emitt d by the
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Thi f shly p epared ointment is th n ppld
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meter in va l e but layer f fr m 2 to 3 mm will
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more u i m tre gth d ing th ent e applicat on

The ointment co e ed by a rubber dam or cello-
ph n the edge of v h ch a e secured to the sk n by
adhesiv plaster to p event d f sion of the radon gas

The conc tration of the ointment varies from
24 t 0.060 mc per gram of va eline As a rule
a ppl cat ons are l ft on for e ght hours and epeated
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10 pe c nt l nol n t th i tm nt makes no d ffer
ence as far as the p n tration f the a lon nto the
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Altog ther 69 ulcers er treated Of these 2
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proved to such an e tent as to be nol nger su pected
f being recurr nce No example of simple necrosis
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The authors lso sed the method in 7 r c lcit nt
cases of ch nic arc se ulcer t tal ng 5 s p rate
are N ne areas h l d promptly 5 mpr ved and
only 1 failed to show any respo e Th e chron c
ulcers in scars f llo ing burns nd surgerv in hich
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completely

T o ca e r ports r incl ded in b ief rés més to
llu trate the m thod of p ocure and the subs
que t cl nical course of heal g

The c nclusion s dra n that the cellent mmed
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not ly in postirradiat onal ulcers b t al o n ther
ben gn chron c ulcerat lesi s The t me s too
short as yet to as ess the perm ncy of the res lts
It is bel eved h w er that the fi ld of application
could b exte d el nd that th m thod may al o be
of a tanc in m lary surg v

T L ct MD

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m th

W th such dos ges f c urs s e r a t i o n s
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ults bta n d n cases fca c n ma f the l y n x a
fa o abl that oe tg n therapy should be
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s g e l t r v nt sh l d b p f o m d nly as n
dd t l m asu e J r v W Br ~ M D

Ek R and P ppe E P m r y B n S c m
11 d l St kh 94 3 387

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MISCELLANEOUS

Chyd mus J J R d i t i n I n j r i e s f th l t e s t i n
and Urinary Bladd r Ca s d by Radi m
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(St hl h d d Da m d d r H r b l a s e
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I 33 of th c es the ew e e r r a t i o n s of
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e s i c a g l f i s t l a s) The t e r l b e t w e n th
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a e d f o m f i c e t o th t y m o th Th d t a b e
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bly and th fo e the dos s del e r d in the r c t
were subj e t g t a a t o n s The method l
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Th e much ro m f i m p o e m t of the dos
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W v e M S o l m i t M D

Co per A G S and R bert D F The Treat
m nt f P t i r r d t i n l U l by Radoc
O l n t m n t M e d J A t l 945 97

Th t e t m e n t of pos t d t n a l l e c r s wh c
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the p p l c a t f d n m p g n a t e d a s e l e a s o t
l d by U h l m n h l e d the p o b l m t h
B r s b G e n e l l H s p t l l l c a s x c p t th o
d t r d o s g

To understand the rationale of the treatment it is necessary to expel three misconceptions (1) that radon ointment adds further damage to an already heavily irradiated (The necrosis is not adequate blood supply of scar tissue similar to that observed in keloids following burns or in implant ulcer scars. Small dose of radon in a concentration less than one twentieth of that required to produce erythema in the same time allows complete recovery of the cell in all the instances) (2) that tissue recovery is due to the alpha rays of the ointment (The ionization of the beta and gamma rays which are also emitted during the process of decay of the radon isles than one hundredth of that from the alpha rays) and (3) that the ointment in the strength used has no effect on a malignant lesion.

It is the authors impression that the alpha rays in small doses stimulate and promote the growth of a cutaneous epithelium. There may be a parallel in the effect of very small doses of roentgen rays in the treatment of inflammatory lesions.

The authors prepare their ointment by breaking ordinary radon sealed (cm) glass and with 0.5 mm glass all; jar filled with valene (melted at 44°C). Melt is performed by melting and shaking after the jar has stood for twenty-four hours. The contents are transferred to uniformity of distribution by shaking in the dark and the activity is checked by measurement of the gamma rays emitted by the full jar before use.

The freshly prepared ointment is then applied liberally with a spatula to the ulcer to be treated and about 1 cm of normal skin surrounding it. The thickness of the ointment immediately after the alpha particles has a range of only five centimeters in millimeter in vasculature but a layer five to three mm will guard against the loss of radon and thus insure a more uniform length during the entire application.

The ointment is covered by a rubber dam or cellophane the edge of which are secured to the skin by adhesive plaster to prevent diffusion of the radon gas.

The concentration of the ointment varies from 0.25 to 0.60 mc per gram of valene. As a rule applications are left on for eight hours and repeated once a week for one to two weeks. The addition of 10 percent lanolin to the ointment makes no difference as far as the penetration of the radon into the tissues is concerned. In the interval between the radon treatments unguentum acidi borici (10 percent) or unguentum lei mor huae with valene are applied.

Altogether 69 ulcers were treated. Of these 30 proved to be recurrences of the original malignant lesion. 41 have been completely healed and 8 improved to such an extent as to be no longer suspected of being recurrences. No example of impregnation has failed to respond. In fact a lack of response constitutes an almost sure sign of malignant recurrence.

The authors also used the method in 7 recalcitrant cases of chronic varicose ulcer totaling 15 separate cases. Nine areas healed promptly, 5 improved and only 1 failed to show any response. The chronic ulcers in scars following burns and surgery in which no radiation therapy had been given like these healed completely.

The authors reports are included in brief résumés to illustrate the method of procedure and the subsequent clinical course of healing.

The conclusion is drawn that the excellent immediate results well justify the use of the radon ointment not only in postirradiation ulcers but also in the benign chronic ulcerative lesions. The time is too short as yet to assess the permanency of the results. It is believed however that the full application could be extended and that the method may also be of assistance in military surgery.

T. L. C. M. D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

S It t H H Walk J Jr Rh ad J E nd
Lee W E Th I flu nc f Loc IT tment
f Bu n n Li F n t n A S g 94
9

Th r lat f the l al tr atm t of b r s to
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M o s t o f t h p t n t s r v i d I t i s i m p o r t a n t
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l c a l l y a c a u s o f i n c r e a s d m o r t a l i t y (2) i s t h e
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t h r a p e t i c a g e n t s u d t h e l a t t e m t f t h e
b n e d a e a s ?

The s l e c t o f h e f u c t t e s t s s d i f f i c u l t
s i c e t h l e p l y s a n i m p r t a t o f n m n y
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t h o r s u s e d t h V n d e n B e r g h t e s t t h e b o m s u l
f l e r t t d t h e h i p p u r c a c d r e t o n t e s t a
a d f l o c c u l t i o n o f c h a l n h l e s t e o l m u l i o n
t h s r i e f p t n t s

T n i c a c d w s s o w l l t a b l i s h d i n b u t h e
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a n w d c o m p l t l y I n t h e s e n p a t n t w t h
b u n s f l e s t h a n 4 p e c t d d f t t n n a c i d
t h e r a p y c e p t w h p d t a t o p s y t
h a h a d a d d p t m

A g l c a n t a s p e c t f t h e a u t h o r s p e c e
h w e v h b e n t h f a c t t h t s i n c e t n c i
w a s d c a r d e d p a t i e n t h s r v i d b f
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b u r n t s u s h a s n t b e n a t t e d d b y g e t m
t a l t y J H v E K i r r i M D

GENERAL BACTERIAL PROTOZOAN AND PARASITIC INFECTIONS

Fish A M Th Th rape t i v i f P l c i l l
A p p l i d L o c a l l y B d n E p e r i c i t h t h
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J h H p k H p 045 76 34

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b o d y f l d (3) o t o x t y t h e c e l l c a l l y t
t h b l y g e r a l l y (4) n p d c t o o f l c a l a n d
g e n r a l h y p n s i t y (5) r p d c t o a g i n s t a l l
b a c t a r h g h d i l t i o n a n d (6) s t b l t f l
t o

S c h a p f a t a b c t e r i l b t n c e f u l f i l l g a l l
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e n s i t i v t y T y o t h r n s l m t d b y t s s e l c t
c t i o n g t g r a m p o s t c c i a n d b y h i g h
y t e m c t c t y P c l i n i s h i g h l y b l
w t e s l l t d b o d y f l a d t i s n o t
h i b t d b y y b o d y f l d s n b y p m n o b e n z c
c d t s n t t l c a l a t b n g e t m l y
a a d g n r l h p e r s t t y r a c t i o n s h a r
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t p t o c c m n n g c p m o c c e r g o o c o c
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t y p h s b l l p t e p d o m o n a s a e r u g o
(p y y a b e u s) b l l s l k a l g e n e s a l p h a t p o
c u s f e c a l i s h m p h i l u s i n f i n a z e a r o b t
a e r o g e n e s d i f d i n d e b c l l S o m e f t h e
e i s t a b t t p d e p e n c i l l n a s e h c h
c a p a b l o f n e t a l i z n g p e n c i l l i n

A n u m b f i n e t g t r s h a r e p o r t d f
b l c l i n c a l t a l t h t h l c a l u f p e l l
d f f t f m s a n d c t r a t o f f c t n f
t h y e m a s t o d w o u n d s d e s a n d l
w u d s b n w d m p y m a d o s t
m y l i s

T h e a u t h o r s e d f i r s t t h e F l e m g t r i n f
p e n i c i l l i n d l t r t h R C t a a f i
c u l t f i l t a t T h l i t t e p v e d t b e a b o r t

do bly pot nt with an a erag f 100 unit per cubic centim ter Generally the procedure was as foll s
(1) culture of the wound (2) wide incision f the u d with removal of dead t ssue when necessary
an l (3) continu d saturat n of the wound th
f micin until the su unding tssu s tart the
p ocess of epa r

Ninety five ca es tr at d with crude penicillin are reported some pat nts r ceived inj ctions of penicillin along with local applicat ns of the drug The r oses were ost my l tis of the long bon s
chr n ca dacute frontal bone osteomy litis st epto co cal throat s fectio s (ncludi g streptococcus car neri) s nd inf ctions and eye infectio s

Th t l results v re good 63 per cent poor in 13 pe cent and ndefn te in 24 pe cent Co centratons of from 25 to 100 un ts per cubic c ntimeter were u el and w re consid ed sufficient since d lutions of 0.6 units per c llic c ntimeter ha e b n shown to k l l staphylococci streptococci and pneumococci in vit o

Car f l bacteriol g cal determinat n of penicillin s it ity f the inf ct g bacteria sh uld alway precede actu l t e tment hen infection le pe the combinat n with th systemic se f p n c l l n r with sulfonamides o ty thricin m y l ad v s able These drugs ar compat ble in combinat ns

The local applicati n f penicillin for localiz d infect n appe rs m r economic l ad effc t provided the lesion i open and the inf ct on n t too d ep but g ral u g cal p n c l s ch as d an age of p s rem l f questr and excision of d ad tis ue must n t b n gl c t d

ARTHUR J IES E MD

DUCTLESS GLANDS

G e kan K I Ch nic Tl yr l d l t s and P m ry
Thyrotic l s (Ex phit) Imic Golt t h
S f 945 5 5

Th auth r pot t h c of a fifty s x yea old m le h had a t n y hard thro d that s diag osed p ope r t cly as carcin m Th ba l m tabol crat s +87 a d there was ex phthalm s al ng th the clacal symptoms of thyroticosis
A btal thyr l tomy as perfo m d Th h t l g al d g s vas ch on c thyr l d t

Th a th r f s nts this case beca e of th t m ra it f hth l m c g ite as cat d th ch on c th r o i t

F R O L M MD

Bar l E C Th U f Thi acil in the P
Peralt Prep rat n f P t l nt with Se e
Hyperth l d m A l t Jf 945 105

Th a th repo t s s 64 cases f h pe th r d m tr at l th thyr cl a l ub q ntl operat d pon at the Lab C lnc f t pat nt were se e l t v c d w l d t a b n po per at r l s if prepa d th l u g l t t n a l
Cal ex r c l l t th co c l th t t
thou acil pat nt h ul n t b n t f pe at
until a n m l r n arly mal basal m t bol m

recorde l Th time requir ed t reduc the ba al m tabol m s roughly one d for each per cent to be reduced In this sen e the average p e t r a t m e t basal metabolism rate was +51 per cent and an average of fifty-eight days was required f r low ring the metabolism to the proper lev l for surgery Tho patients who had p e v i o u s l y r e c e i d e d I g o l s s o l u t i o n requir d a longer treatment with th uracil There was an average gain in weight of 13 p unds the g atest gain was 30 po nd The treatment of patients without heart f l u r e was ambulatory v ith exam at on and a blood c unt e ry two or three eeks Patients with heart failur ere h spital zed

With th o acil t e a m e t a l e the thyroid gland at operat n was found to be soft and friabl and to bleed excessivly which increa ed the op at n e d i f f i c u l t c o n s i d e r a b l y Th a s v e c o m e b y s t a r t i n g i o d n e a d m i t r a t i o n a s s o o n s the basal metabolism s te had reached +2 per cent cont n u n g th ouracil for another three eek and th n g v n g i o d e a l n e f o r n e w e e k b e f o e s u r g e r y The nes the a and postoperative co rse w e c u n e v e n t u l

T x i c a c t i o n w e e n c o u n t e r e d i n 8 o f 9 c a s e s Only 1 of these was includ d in the 64 cases of the pr nt repo t On pat n e h i b i t e d a skin erup tu 4 h d f v e r and 3 developed leucopena In ery i stance symptoms of thouracil into cat on u b s d o n d i s c o n t i n u a n c e o f the drug

The a e r a g e h o s p i t a l s t a y n d r t h o u r a c i l a s f o m s e n t o t e n d a y s u n d L u g o l s s l t i o n a l o n e v e a l w e e k s C l e r t o H T h u r t a M D

SURGICAL PATHOLOGY AND DIAGNOSIS

Web t A St nhouse E Pars n E Philp p
A and Oth rs A St p in Canc Contr l
Jl o s Jf J 1945 87 9

The sha p i n e r a s e i n d e a t h s f o m c a n c e r i s r e a d b y n d r s t a n d a g n o s i s b e c a u s e f the n c r e a e i n k i l l i n m d e r n d a g n o s i s a n d the p r o l n g d f f p a n I n r d e r t i m p r o v e the s t a t i s t i c s f o r t r t m e n t d a g n o s i s m u s t b m a d e l y a n d a d e q t t r e a t m e n t b e g u n w h i l e t h e i s a c h a n c e t o d e s t o y the n e o p l s m

Th c a n c e c n t r l J n i c e t u p C h i c a g o i p o n s o r d b y the Ill n s D i v o n f t h F e l d A r m y f t h c o n t l f c a n c e r a n l the p u p o s o f the c l i n i c t p r i v i d p e i o d i c a m n t n s f o a p p a r n t l w e l l o m e n i n a n a t t m p t t o d t e t e a r l y n p r c a n c e r s l e s i o n s t r e a t m t s a r e g i e n t h c l c l f u s p c i l e s n a e o t e d t h p t n t e s r e d t h f i m l y p h c i a n f f u r t h e r i g n o s t c c t g a t a d i f r e

f h p t e n t n n t h c l c t i On the f f i t a d a l e d m e d i c a l a n d o c i a l h t s t k n a n d a c o m p l e t e p h y c a l a m n t n i m a d The l b a t o r y o k n e l u i u a l c o m p l t b l o o d c n t s a n d r l o g y t e s t s c o r r a l n d u r t h l m e a r s n d c h e s t f l u o s c o p O t l n d s t h e s l t f t e u t l x a m t n a r i n t p r t f the pat n t a n f i a d v l t c o n l t h n p h y s i c i a n f a n o t r i n s t i g t n d a t l

TABLE I — PELVIC FINDINGS

Condition	Number of Cases
L. t. r. n. l. G. n. l.	
K.	13
Serul. p. r. i. t. i. d. g. t.	6
S. b. a. cyst. f. l. a. b.	3
L. c. h. f. i. t. i.	
E. l. l. g. e. d. b. a. t. h. l. g. l. d.	4
U. t. h. l. e. a. r. u. l.	3
V. g. n. l. c. y. s. t.	
C. y. t. o. c. e. l. (with ympt. m.)	9
C. r. v. i. x.	
L. a. t. e. d. h. y. p. t. p. h. d.	6
E. n. s.	73
P. l. y. p. s.	9
T. n. h. m.	5
C. o. r. p.	
R. t. e. d.	8
F. b. r. o. d.	35
P. l. a. p. s.	3
A. d. e. x. l. m. a. s. r. n. l. a. g. d. r. y.	
R. i. g. h. t. d.	4
L. e. f. t. d.	5
B. l. t. l.	5
T. u. m. f. b. d. m. i. n. l. w. l. l.	
S. t. r. i. t. f. i. t. h. e. n. a.	

Th. pu. pos. f. this. art. l. i. to. r. port. the. results
f. th. m. t. i. o. of. th. first. 600. p. t. i. n. t. s.

S. k. Tw. h. n. d. d. d. ne. of. the. t. t. l. p. a. t. e. t. s.
wer. e. e. n. b. t. h. d. e. r. m. a. t. i. g. s. t. and. of. th. s. g. o. p. 8.
had. c. l. i. n. c. a. l. l. y. d. i. g. n. o. s. a. b. l. e. s. k. a. c. n. m. a. 5. had.
u. p. e. c. t. d. m. e. l. n. o. m. and. a. h. d. p. e. a. n. r. u. s.
d. r. m. t. o. s. e. s. E. g. h. t. y. b. p. t. n. t. had. p. g. m. n. t. d.
a. d. n. p. g. m. n. t. e. d. n. i. and. m. a. v. t. h. e. r. p. a. t. i. n. t. s.
h. d. m. n. o. s. k. n. c. o. d. t. o. n. s.

b. s. t. There. w. e. r. p. e. d. c. a. s. e. s. f. c. a. c. i. n. o. m. a.
f. th. b. r. e. a. s. t. m. g. t. h. 600. p. a. t. i. n. t. s. Th. b. r. e. t. s.
wer. e. x. a. m. i. n. e. d. b. y. p. l. a. t. n. and. t. a. n. s. l. u. m. n. i. t. i. n.
n. d. w. h. e. n. b. p. s. y. w. c. o. n. s. i. d. e. r. d. t. b. i. n. d. c. a. t. d. the.
p. a. t. i. n. t. s. w. e. r. r. e. f. r. e. d. t. t. h. o. w. n. p. h. y. s. i. c. s. n. s.
F. o. r. t. y. t. m. e. n. c. o. m. p. l. e. d. o. f. n. t. b. e. a. s. t. r.

pa. i. the. b. e. a. s. t. and. i. n. 7. p. e. c. e. n. t. of. the. s. e.
a. b. n. o. m. a. l. t. i. e. s. w. e. n. o. t. d. i. n. o. n. l. y. 3. of. the. 4. c. a. s. e. s.
w. a. s. t. h. e. a. p. a. l. p. a. b. l. e. m. a. s. T. t. y. s. x. p. a. t.
c. m. p. l. a. n. e. d. f. l. i. m. p. n. the. b. e. a. t. 8. of. the. s. e.
c. y. s. t. c. m. a. t. i. s. a. d. 4. had. c. a. r. c. n. m. a. i. n. s. i. n. s. t. a. c. e.
t. u. m. o. r. s. f. the. b. e. a. s. t. of. w. h. i. c. h. the. p. a. t. i. e. t. w. e. r. e.
e. r. e. f. o. u. n. d. 4. of. these. w. e. r. m. i. g. n. a. n. t. O. f. 13.
p. a. t. i. n. t. s. i. n. w. h. o. m. b. i. p. s. v. w. a. s. r. e. q. u. e. s. t. e. d. 3. w. e.
s. u. b. j. e. c. t. d. t. the. p. r. o. c. e. d. u. r.

P. l. i. Only. 16. 4. p. e. c. e. n. t. of. the. 600. w. o. m. e. c. o. m.
p. l. i. n. d. o. f. p. e. l. c. s. y. m. p. t. o. m. s. B. i. m. a. n. l. a. m. a. t. i. n.
n. d. i. u. l. t. i. z. a. t. i. o. n. of. the. a. g. a. and. e. r. r. o. r. t. h.
s. t. n. g. l. i. g. h. t. w. a. s. c. a. r. r. i. d. o. t. b. y. a. t. r. i. n. d. g. y.
e. c. o. l. g. t. l. h. p. e. l. v. i. c. a. n. d. g. s. a. l. s. t. d. i. n. t. h. a.
c. o. m. p. n. v. g. t. b. l.

N. f. t. h. c. a. l. p. o. l. y. p. s. p. o. d. t. b. e. m. a. l. i. g.
n. a. n. t. w. h. e. n. b. p. s. e. d. A. m. o. g. 73. c. r. v. c. l. e. r. e. t. o.
t. h. w. a. s. n. o. e. p. t. o. f. m. a. l. i. g. n. a. n. c. y. t. h. 7. c. a. s. e. s.
w. h. i. c. h. a. b. i. o. p. s. y. w. a. d. i. d. T. e. l. p. a. t. i. n. t. s. 4.
c. m. p. l. a. e. d. o. f. a. g. n. i. b. l. e. d. g. n. t. a. t. d. t. h.
m. n. t. r. u. l. p. e. o. d. r. e. a. m. e. d. I. n. 6. u. p. o. n. w. h. o.
d. l. t. a. t. n. a. d. c. u. e. t. t. a. g. w. e. e. d. o. and. r. e. p. o. r. t. s. n. e.
c. e. d. n. o. m. l. g. n. a. n. c. y. a. f. o. u. d.

O. e. p. t. i. e. n. t. h. a. d. a. n. n. o. p. e. b. l. p. e. l. m. l. g. n. a. n. c. y.
d. a. n. t. h. e. h. a. d. a. n. a. l. y. a. d. e. n. c. c. m. t. h.
b. o. d. y. of. t. h. t. e. r. u. s. T. h. e. s. e. t. h. n. l. m. l. g. n. a. n. t.
c. d. t. o. s. i. d.

F. l. s. c. p. f. i. d. g. O. n. u. t. i. n. c. h. e. s. t. f. l. o. s.
c. p. y. 4. of. t. h. p. a. t. e. t. s. h. a. d. n. u. s. a. l. f. i. d. g. s. O. f.
t. h. e. r. m. i. n. g. w. m. 7. h. a. d. b. n. o. m. l. c. a. r. d. c.
s. h. d. o. 37. a. b. o. r. m. l. l. u. n. g. m. r. k. i. n. g. s. and. 6. a. b.
m. l. k. l. e. t. l. h. a. g. e. s. V. t. u. b. c. u. l. o. s. a. s. f. i.

G. t. o. t. e. s. t. a. l. t. t. O. e. p. a. t. i. n. t. h. a. d. a. c. u. l.
f. l. e. l. k. e. a. r. n. m. a. t. h. e. c. e. t. a. l. a. m. p. u. l. l. i. s. h. a. d.
b. g. n. t. m. o. r. s. 2. h. a. d. h. e. m. o. r. h. o. d. and. t. h. e. m. a.
d. f. t. h. e. n. t. r. g. r. p. o. f. 52. h. a. d. m. e. t. a. l.
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E. 3. F. t. e. n. of. t. h. 600. p. t. i. n. t. s. r. e. f. o. d. i. t.
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e. a. c. h. 3. a. d. n. o. l. v. o. n. 3. e. N. o. c. u. l. t. u. r. s.
w. e. r. e. f. o. d. J. R. r. W. I. L. S. O. M. D.

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SURGERY

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VOLUME 81

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NUMBER 4

II THE VALUE OF THE VAGINAL SMEAR IN THE DIAGNOSIS OF UTERINE CANCER

A Report of 1015 Cases

JOE V MEIGS M D F A C S RUTH M GRAHAM BS
MAURICE FREMONT-SMITH M D LOIS T JANZEN BA and
CAREY B NELSON BA B S M Ch sett

EARLY accurate diagnosis of cancer of the female genital tract has long been the goal of gynecologists. Ewing (3) states that in 1931 14,464 women died of cancer of the uterus or 12 per cent of all cancer deaths were due to this one type. This is exceeded in frequency only by carcinoma of the stomach. Ewing arrived at figures of an average of 10 per cent approximate 5 year cures for uterine cancer. He calculated that the possible cure under ideal conditions is intelligent public skillful and experienced specialists and modern equipment would be 40 per cent. The discrepancy between the possible rate of cure and of actual cure bears a direct relationship to the time at which diagnosis is established and treatment instituted. We feel that the vaginal smear technique for diagnosis of uterine malignancy is a definite forward step in the early recognition of the disease.

In 1943 we (2) reported 220 cases studied by vaginal smear for cancer. This report confirms the previous findings of Papanicolaou

and Traut as to the value and accuracy of the vaginal smear as an aid in the diagnosis of uterine malignancy. Since our last paper we have studied an additional 795 cases making a total of 1015 cases studied by this method with a total error of 4.0 per cent. The patients for this study came from the Vincent Memorial wards and the Tumor Clinic of the Massachusetts General Hospital and from the private practices of several physicians.

NEGATIVE CASES

Of the 1015 patients 861 showed no evidence of cancer. Of these 36 per cent had biopsies either of the cervix or of the endometrium or the whole uterus was removed. These proved negative diagnoses are listed in Table I.

In addition to those shown in Table I our negative group also includes 48 negative postoperative and 89 negative postradiation patients (Fig. 1). These women had proved malignant growths of the uterus treated either by x-ray, radium or surgery and are now clinically well. Also included are negative cases patients who did not present enough evidence for malignant disease to require

From the Vincent Memorial Hospital, 11th Gynecological Service of the Massachusetts General Hospital, Boston, Mass.

operative procedures. In this series of 861 negative cases 5 mi taken positive diagnoses were made by vaginal smear. These we regard as mistakes since repeated biopsies were carried out in all cases and in none was microscopic evidence of tumor found. This represents an error of 2.9 per cent in negative called positive. These mistakes will be discussed in a later paragraph.

POSITIVE CASES

In this series of 1015 cases 154 were shown to have cancer on microscopic section. The positive cases and their pathologic diagnoses are shown in Table II. Of these 154 positive cases (39 endometrial and 109 cervical cancer) 16 cases were incorrectly called negative by vaginal smear. This is an error of 10.3 per cent (see Fig. 2). Of these mistakes eight were in the endometrial and eight in the cervical cancers.

The mistakes in this group of cases fall into two categories. The first includes smears in which cancer cells were present but were not seen on the original examination of the slide. On review of these smears the cancer cells are so obvious that there could have been no question of interpretation. These cells were missed because every field was not examined. Seven of 16 mistakes were of this type. The second group are those in which no cancer cell were found even after the slide were reviewed. We must assume that in these 9 instances malignant cells did not exfoliate or that degeneration of the malignant cells had occurred. We are including these in our mistakes. They actually present a limitation inherent in the method. Of these 9 6 are from cases with endometrial cancer. The fact that

cell from endometrial carcinoma frequently fail to appear in the vaginal secretion explains the lower diagnostic accuracy evident in this group.

We will review briefly the criteria for the recognition of cancer cell in the vaginal secretion. More extensive descriptions including technique and staining may be found in the monograph by Papanicolaou and Traut or in our previous publication (). The basal cells are round or oval cell with green cytoplasm and an active vesicular nucleus. These cells may vary in size. The second group, the precornified. These cells are larger and more transparent than the basal cells and have a smaller vesicular nucleus. The third group is the cornified which are similar to the precornified except for an acidophilic cytoplasm and a pyknotic nucleus. Endometrial cells are encountered occasionally in the vaginal secretion. These cells are very small and have a small vesicular nucleus with very little cytoplasm.

Malignant cell show a good deal of variation much more than is seen in the histological section of the same tumor. The cell shed from an epidermoid cervical cancer are of two types depending on whether the tumor itself shows any differentiation. The differentiated cells show extreme variation in size and shape. They may be extremely elongated resembling very closely a muscle fiber cell except for the long hyperchromatic nucleus. They may be rounded at one end with a long tail—the tad pole cell. The differentiated cell have an adequate amount of cytoplasm but it is abnormally distributed.

The characteristics of the undifferentiated cells are as follows: (1) they occur often in groups (); the nuclei which are hyperchromatic show marked variation in size even to 100 per cent; (3) the nuclei stand out against a homogeneous background of cytoplasm in

TABLE I — PROVED NEGATIVE CASES

Chronic	66
Fibrous	36
Endometrial hyperplasia	3
Fibroid	76
Endometrial	6
Miscellaneous	9
Adenomyosis	
Atrophic	3
Secretory	6
Proliferative	—
Normal	3

TABLE II — POSITIVE CASES

Epidermoid carcinoma	11
Recurrent	15
Adenocarcinoma	1
Adenocarcinoma	1
Adenocarcinoma	1
Recurrent	1
Adenocarcinoma	1
Carcinoma	1

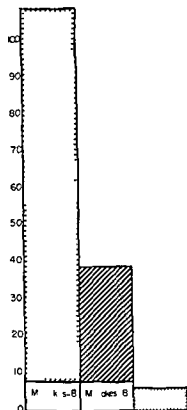
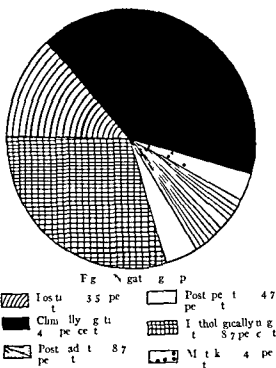


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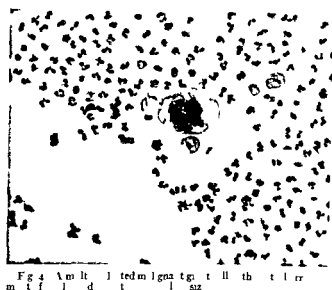
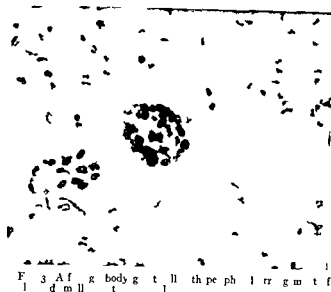
which cellular borders are often indistinct. If single cells are encountered an increase in nuclear size in relation to cytoplasm is the most important diagnostic aid. Adenocarcinoma of the cervix also shows cells of this undifferentiated type.

The diagnostic criteria for endometrial cancer are similar to that for undifferentiated cervical cancer. The cells have large nuclei with little or no cytoplasm. The cancer cells from endometrial cancer are more likely to be present in clumps with the cells in a dense mass. The size variation of the nuclei is not as great as seen in cervical cancer.

In reviewing our mistakes in the group negative called positive (false positive) we have found certain cells, probably histiocytes, which often give trouble in making the correct diagnosis. In our 25 mistakes 8 were in correctly diagnosed positive because of the presence of these cells. There are 3 types of histiocytes. The first and most familiar is a large cell with vacuoles containing ingested material such as red blood cell and leucocytes. These are easy to recognize and are not the source of trouble. However the next two

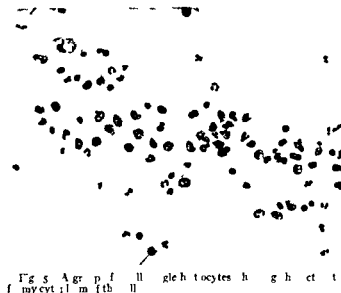
groups have proved to be very misleading. One group comprises the foreign body giant cell. These are very large cells with sometimes as many as twenty nuclei. The nuclei are apt to have a characteristic peripheral arrangement (Fig 3). Occasionally however there may be so many nuclei that they occupy the whole cell. These foreign body giant cells may be interpreted as malignant giant cells if careful attention is not paid to the regularity in size of the nuclei and the adequate amount of cytoplasm present. These foreign body giant cells contain many nuclei which do not vary in size appreciably while in the malignant giant cell the nuclear size varies a great deal. The

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nuclei of the cancer cell stain much more deeply than those of the foreign body giant cells. In the malignant giant cell the nuclei usually fill the entire cell so that only a thin rim of cytoplasm remains visible. The difference between the two types of cell can be readily seen in a comparison of Figure 3 which demonstrates a foreign body giant cell and Figure 4 which demonstrates a malignant giant cell.

A third type which leads to confusion is the small single histiocyte without ingested material. These cells often occur in groups and are then apt to be mistaken for undifferentiated cancer cells. Figure 5 shows such a group. Occasionally a group is found which is phagocytosis—an epithelial cell and in this instance it is easy to classify such cells as histiocytes. Other groups are much more difficult to interpret. There are three criteria



for differentiating small histiocytes from cancer cells. The most important one is that the small histiocytes have a foamy vacuolated cytoplasm which is absent in the malignant cell. Second the nuclei of the histiocytes do not vary markedly in size and finally the entire cell is smaller than the undifferentiated cancer cell. Compare Figure 5 with Figure 6. In 2 cases in the negative group false positive diagnoses were made because of the pres-

ence of normal endometrial cells which were mistaken for cancer cells. The reason the endometrial cell prove troublesome is that their nuclei are hyperchromatic and there is very little cytoplasm. Since malignant cells have hyperchromatic nuclei and little cytoplasm the reason for the difficulty is readily seen. However the cytologist should remember that nuclei of undifferentiated malignant cells vary a great deal in size. This is not true

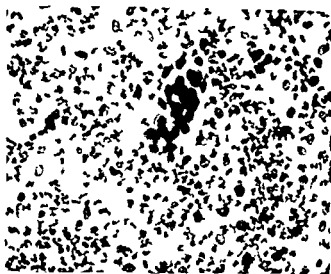
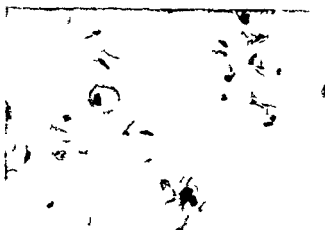


Fig 7 Sm h w i g gr p f berra t b l ll th t
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of the endometrial cell where the nuclear size variation is small. It is important to remember that when there is bleeding from the endometrium normal endometrial cells are often encountered.

Another type of cell which has caused some confusion is the atrophic cell of the basal layer of the vagina. When a vaginal smear is composed entirely of basal cells aberrant forms are often encountered which are not

easy to classify. These cells account for 8 ml takes in the group of negative called positive. We have found that a satisfactory solution to this problem is to change the vaginal epithelium from atrophic to cornified by the administration of stilbestrol (1 mgm per day for 10 days) as originally suggested by Lapanicolaou. The basal cells will be completely replaced by cornified cells and at the end of the stilbestrol treatment the confusion atrophic

cell will have disappeared. A comparison of Figure 7 and Figure 8 represents this change.

The 7 remaining mistakes in the negative called positive represent smears which on re-examination still show in our opinion malignant cells. Two of these women have had hysterectomies for fibroids and no cancer was found. The remaining 5 have had biopsies only and in 1 case the biopsy specimen was unsatisfactory. We have no explanation for this discrepancy other than to postulate that perhaps a small tumor may have been missed at the pathological examination. In our previous paper we reported a case in which no cancer was found by the pathologist on routine examination but cancer was demonstrated after many subsequent sections were cut and examined. Te Linde in a discussion of this very problem reports 11 cases of early cervical cancer. He says: "In approximately half of the cases several well trained gynecological pathologists were unwilling to make the diagnosis of cancer from the changes noted in biopsy specimens. In all instances [after operation] the entire cervix was cut into blocks and in many cases much careful searching had to be done before an area of actual invasion was found."

DISCUSSION OF CASES

To illustrate the value of the vaginal smear in the early diagnosis of cancer we are abstracting 8 cases diagnosed primarily by vaginal smear. Two cases represent endometrial cancer, 5 cervical and of the 5 cervical cancers 3 are carcinomas *in situ* of the cervix.

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These cases illustrate that the vaginal smear is of great value in the discovery of unsuspected cancer. In 5 of the cases the cancer was not recognized although it was in that portion of the cervix which could be easily visualized. In 2 (the carcinomas *in situ*) the biopsies did not establish a diagnosis. The case in which both pyometrium and carcinoma of the endometrium were present is an excellent example of the aid the vaginal smear may render in establishing a diagnosis of cancer.

The case with carcinoma of the endocervix presents a special problem. If a woman has an early symptomatic tumor in that region mere vaginal examination of the cervix will not rule out the presence of carcinoma. This is true of course also in the endometrial carcinomas. By the time symptoms appear the tumor may have advanced to a stage where it is incurable. A vaginal smear may disclose the presence of such tumors in an early stage.

DISCUSSION

For the diagnosis of uterine cancer inspection and palpation have been found to have obvious limitation. For this reason various

aid to earlier diagnosis have been suggested. In 1931 Schiller advocated painting the cervix with a solution of iodine. The normal tissue of the cervix stains dark brown because of the glycogen content of the cell. Because of the lack of glycogen in leucoplakia and cancer the cells stain very lightly or not at all. Unfortunately erosions and inflammation also take the stain to a very limited degree so the picture may be confusing. The greatest value of the Schiller test is that it indicates those portions of the cervix from which the biopsy should be taken.

Another method proposed for early diagnosis is the colposcope developed by Hinselmann. The colposcope has been found to be of little practical value in examining large numbers of women not because of any error inherent in the method but because of the gynecologists unfamiliarity with the magnified cervix.

The most important method is the biopsy. It establishes the diagnosis. However the biopsy is not infallible. It must be taken in that portion of the cervix where tumor is present. If the tumor is clearly visible the site of the biopsy may be easily determined. The chances of missing the tumor if the cervix merely presents a suspicious appearance are greater. Two of our cases of carcinoma of the cervix *in situ* were not demonstrated by biopsy though one was reported as "carcinoma *in situ*" and the subsequent negative biopsy was taken as near the same site as possible. Davis reports that in a study of 1200 cervical biopsies 238 sections showed no squamous epithelium and 300 were without gland tissue. It is evident that even assuming the most accurate histological diagnosis the efficiency of the biopsy in this group was only 75 per cent. It is perhaps important to note that in our 1359 smears only 14 smears were unsatisfactory for purposes of diagnosis. Biopsy moreover requires certain operative facilities and it is not practical to carry it out on a large series of patients not suspected of cancer. A method which can be accomplished more easily and is still accurate would be a

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great aid in early diagnosis. We believe that the vaginal smear represents such a method. We certainly do not feel that it should replace biopsy but rather that it is a very valuable adjunct to biopsy. Its advantages are: It can be carried out on a much larger group of women due to the ease with which a specimen may be obtained. It does not require special facilities. Any doctor in his office may take a vaginal smear and send it to a central laboratory where it can be examined by technicians trained in the method. The region examined is not limited by the size of the sample taken; the smear takes a fair sample of all cells desquamated into the vaginal secretion. It is not an expensive method.

The vaginal smear has the disadvantage that it does not show the grade of malignancy; moreover in some instances it is impossible to say from the study of the cells desquamated into the secretion whether the cancer is cervical or endometrial.

CONCLUSIONS

1. The vaginal smear technique is an accurate method of diagnosis of cancer of the uterus.
2. Vaginal smear and biopsy are complementary techniques which used together will enhance the effectiveness of the diagnostic clinic.
3. The most important contribution of the vaginal smear technique may be in cancer

control. Large numbers of women may be screened and those with positive smears studied further by biopsy.

4. We do not regard a negative smear as excluding cancer, nor do we regard a positive smear without biopsy corroboration as an indication for surgery.

SUMMARY

We have presented 1015 cases studied by vaginal smear with a diagnostic error of 4.0 per cent. Difficulties in diagnosis are discussed. The accuracy of the method is emphasized. Mistakes are evaluated. Eight early cases of uterine cancer demonstrated primary by vaginal smear are discussed. The value of the method for cancer control is suggested.

Our statistics have been reviewed by Dr Herbert Lombard of the Massachusetts Department of Public Health.

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THE OPERATIVE TECHNIQUE OF COMPLICATED VESICOVAGINAL AND URETHROVESICOVAGINAL FISTULAS

S. V. HAYES OBE FRCS FRCOG L. t. t. C. I. I. M. S. L. h. I. d.

THERE is a general impression fostered by the reiterated statements of textbooks that to cure a vesicovaginal fistula requires a superlative degree of skill and a large number of special instruments. It is true that quite a number of fistulas we see have been operated upon by others. Masson and Wilson 1941 report 9 out of 48 cases had 90 operations or more than 3 per patient. Even so it must be realized that to attain a high degree of skill at any operation requires practice and as vesicovaginal fistulas are not common it is not possible for the average operator to obtain the necessary practice and knowledge of the various types of complications. The literature though extensive is not sufficiently detailed. This article summarizing 16 years experience is written with the object of assisting the intermittent operator as our opinion is that provided the operator has a good theoretical knowledge of the various technical details and complications he will obtain good results.

With this object in view 3 types of complicated fistulas have been illustrated to indicate the detail of technique i.e. (1) lateral type (Fig. 1, 3 and 4) Adherent to the descending ramus of the pubis (and usually associated with partial destruction of the urethra) (2) type with the upper portion of the urethra involved and which requires reconstruction (3) large fistulas.

All operations have been by the vaginal route (flap-plugging type) first described by Colli (1861) later by Lawson Tate (1889) and extended by Mackenrodt (1894). Reference is invited to the detailed review of the literature and bibliography by Naguib Pacha Mahfouz (1938). To him and to all other writers on the subject we offer our acknowledgments and appreciation.

TYPES OF FISTULAS AND PRELIMINARY STUDY

A careful preliminary study of the fistula is essential. Simple fistulas involving the bladder and free from or with slight fibrosis are easily cured by adopting the principles to be described. Complicated fistulas present greater difficulties owing to their varied nature as a result of destruction of tissue and resulting fibrosis. Rarely are two the same. Any or all of the following complications may be present.

Stenosis of the vagina in all degrees the most severe being when the normal vaginal wall are replaced by rigid fibrous tissue and the orifice admits one finger or partial stenosis the result of patchy fibrosis may be present.

Fibrous bands The commonest type is a transverse band at the junction of the upper and middle third of the vagina causing an hour glass contraction in the upper portion of which is the cervix and often the obscured fistula. The consistency of the band is frequently of cartilaginous consistency.

The site of the fistula arises from pinpoint to the whole vault of the vagina in which case the bladder is prolapsed. The shape varies considerably and is governed by the site and amount of fibrous tissue. A common type is a transverse oval one or both ends being fixed by fibrous tissue to the ramus of the pubis. The position of a fistula is not constant. It may be central and easily accessible or hidden up behind the symphysis. A common and difficult site is high and deep appearing from slightly laterally and behind the descending ramus of the pubis to which it is adherent.

Mobility of the cervix is often impaired and in some cases the cervix is completely immobilized by a solid mass of fibrous tissue thus considerably increasing the difficulties of obtaining a good exposure. The fistula may be completely immobilized and attached to one or both descending rami of the pubis or to the posterior surface of the symphysis or it may be in the centre of a mass of fibrous tissue.

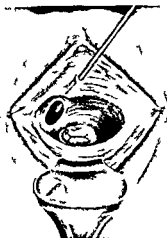


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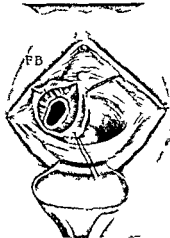


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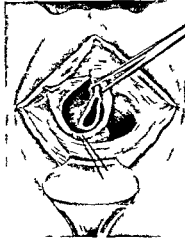


Fig 3

Fig 1 Lateral fistula descending from the urethra to the vagina. Fig 2 Lateral fistula descending from the urethra to the vagina. Fig 3 Lateral fistula descending from the urethra to the vagina.



Fig 4

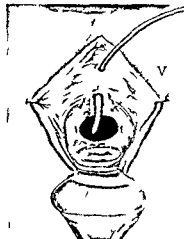


Fig 5

Fig 4 The fistula has been closed by the use of a rubber catheter. Fig 5 The fistula has been closed by the use of a rubber catheter.

Finally the urethra may have been destroyed in part or rarer (2 cases) in its entirety. In an average complicated fistula half the urethra is absent to be considered later. The upper urethra may be occluded by fibrosis.

Careful preoperative study of these many points will be well repaid and during this

study a plan of operation should be prepared. If necessary the patient should be anesthetized.

ONE OR TWO STAGE OPERATION

The large majority of fistulas can be cured by one operation (of 83 operations 78 were one stage). With large fistulas a two stage

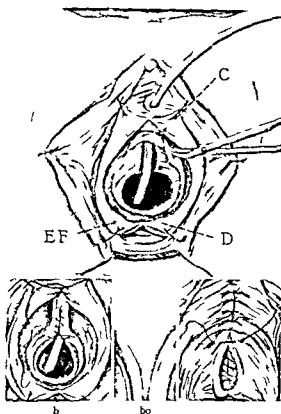


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N 4 rubb cath t On July 3 94 th fit la
adm t t d ang The ur th a m bl d
c mpt lly c ptf ch ttp Th fit la
m bl iz d b t m bl iz t s ly f a d
tur po bl Acath te df 23 d
R ult c r d

We are very favorably impressed with deliberate two stage operations for large fistulas. As the urethra is usually partially absent care should be taken to confine the first operation entirely to the reduction in size of the bladder fistula and thus reduce the formation of fibrous tissue in the urethral area.

PREOPERATIVE TREATMENT AND PREPARATION OF THE PATIENT

Cystitis is treated by irrigating the bladder and vagina twice daily with normal saline of a temperature not higher than 100 degrees F. If hotter than this a local hyperemia is produced which increases oozing at operation. Excoriations of the vulva and thighs are treated by sitz baths followed by an ointment of equal parts of zinc oxide and lanoline. A mild aperient is given the night before and an enema on the day of operation. The operative area is shaved in the ward and prepared on the operation table by thorough washing with either ether soap or soap and water—the area being irrigated at the same time with sterile water. The area is then dried with cotton wool and painted lightly with tincture of iodine or other antiseptic. We have abandoned the use of drugs said to be urinary antiseptics.

THE OPERATION

Instruments. The special instruments used consist of (1) Irwin Moore's cleft palate scissors—curved on the flat. The cutting edges being $1\frac{1}{4}$ inches long and the points specially ground to a long bevel. (2) Long tonsil dissecting forceps—one pair with and one without teeth. (3) angular nasal forceps (Luc's) for swabbing. (4) Mayo's round bodied needles No. 18 with No. 0000 or No. 00 catgut for closing the fistula and No. 1 with No. 1 catgut for the vaginal mucosa. (5) Bozeman's needle holder. (6) a sharp pointed cataract or any small sharp pointed knife. (7) a standard set of gynecological instruments.

We have found no use for the large variety of special scissors, knives, etc. devised for fistula work. The simple instruments here described have sufficed for all purposes. Retractors (except perineal) are rarely used as they obscure the vision.

Position of the patient during operation and exposure of fistula. The correct sitting of the patient and operator in order to provide the maximum exposure is of first importance and requires care. Shoulder rests are fixed to the table and the patient is placed in the lithotomy position. The operator sits as low as possible on an adjustable stool. The table is now raised and tilted and the buttocks are raised to a

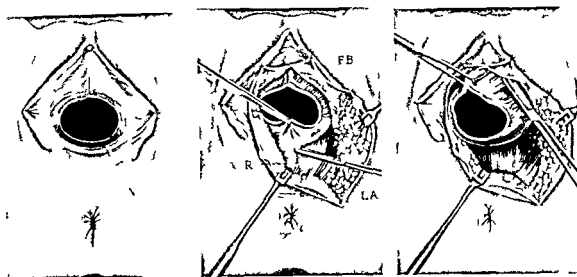


Fig 7

Fig 8

Fig 9

Fig 7 Sch ha dt ci (h ld be l t l) FB Th f t l be g p t d f m th ctum R
 f f g f t l h b d p d t h l t L f l to
 Fg 8 Th b b d h ld be t th bl dd
 hu h bec t f sa y Fb l d be se Fg 9 Tb b d h ld be t th bl dd
 pos bl d t ll t t d N t th free m b l ty

height and inclination that provide the best possible exposure of the fistula. The resultant position is usually with the patient at 15 degrees and the vulva at about eye level. Adjustments are made as required during the operation. A good head light is essential. The labia minora are retracted laterally by suturing them to the inner portion of the thighs the sterile sheet being included in the sutures.

In the majority of complicated cases it will be necessary to provide for additional exposure by means of Schuchardt's incision which can be made on the left or right but more commonly on the left side. The left forefinger is inserted into the vagina and the posterior wall is depressed toward the anus. This safeguards the anal canal and stretches the labium. Cutting laterally the operator makes an incision in the left labium at the junction of the middle and lower thirds. This incision is continued upward through the vaginal mucosa and on the posterolateral wall (still cutting outward) as high as is necessary. Externally it is carried downward in a curve with the convexity outward to a point midway between the tubercle and the anus. The incision can be deepened as much as is required and if necessary the levator ani

divided. By means of this incision the vagina can be turned into the shape of a wide funnel with the fistula at the top and excellent exposure is obtained. Double incisions (right and left) are rarely needed. A modification of the incision (Hayes 1937) has been described which enables skin flaps to be fashioned and turned into the vagina for the treatment of stenosis of the vagina.

Figures 7, 8 and 9 illustrate Schuchardt's incision (the beginning of which is too medial) used to overcome stenosis caused by a transverse fibrous ridge in the vagina and indicates the exposure obtained.

Hemorrhage during operation is usually considerable. Infiltration of the operation area with adrenalin 5 minims to 1 ounce reduces the amount of oozing. No attempt at hemostasis by means of forceps and ligature is made. Any visible bleeding point is controlled by underpinning with needle and catgut. Oozing and moderate bleeding are disregarded. The first assistant constantly places gauze swabs of suitable size in the vagina which the operator uses and discards. Time should not be wasted in endeavoring to check any bleeding which does not come from a spurting vessel.

The principles and steps of operation In order to clarify the technique described illustrations of 3 types of complicated fistulas drawn from sketches made during operations are shown. It should be noted that even with perfect exposure fistulas are not so near the surface as the artist for technical reasons depicts. They should be visualized as being inside and not outside the vagina so much so that in some cases the operator is working very high up at the end of his instruments and by touch.

1 *Incision of vaginal mucous membrane and exposure of the fistula or urethra or both* (Figs 1, 3, 7 dotted lines). It will be noted that the edges of the fistula are not pared as if so the bladder is liable to retract and postoperative hemorrhage may result. In 2 cases excision of the edge of the fistula resulted in postoperative hemorrhage and the bladder was completely filled with blood clot. With the present technique no such complication has occurred. The first cut around the fistula is made about 1/2 inch from the edge with the object of marking out the incision. Joining this an incision over the urethra and one toward the cervix are then made. The incision is deepened to the connective tissue plane over the bladder and urethra by holding the vaginal mucous membrane with toothed forceps and cutting with the curved scissors. When the connective tissue plane has been entered the fistula edge is held posteriorly the lower blade of the scissors is slipped in and by cutting anteriorly on both sides in the incision line the vaginal mucosa on both sides is separated up to the incision over the urethra. The vaginal mucosa is next separated from the urethra by cutting with scissors and blunt dissection. The resulting right and left flaps are now freed widely by holding the flaps with toothed forceps and by scissor dissection. The flaps are then adjusted and sutured to the labia minora well out of the way and in a position that will give the best exposure of underlying structures. This provides for permanent retraction. It is advantageous to make the incisions as long as possible.

Mobilization As sutures under tension will cause edema and eventually cut through free mobilization of the part to be sutured

must always be the object in view. Figures 3 and 9 viewed by holding them at eye level and at an angle of 45 degrees indicate what is meant by free mobilization. In both these cases there were dense adhesions holding the fistulas immobile. After mobilization any portion of the fistulas could be freely moved in any direction. The adhesions were easily approximated and suture could be performed without tension. The ideal to aim for is to be able to seize any portion of the fistula with forceps and pull it in any direction with absolute or moderate freedom. While this ideal may not in every case be attained it should always be aimed for.

Immobilization is produced by fibrosis which as stated may vary from simple fibrous band to sheets of fibrous tissue of cartilaginous hardness. Whatever the type and degree of fibrosis present free mobilization can be secured only by cutting through any obstructions with the curved scissors or breaking them down with the first finger.

Before adhesions are cut or broken down it is important to orient the position of the bladder by means of a curved probe or the first finger. This will obviate a traumatic perforation particularly when operating on large fistulas.

Fibrous bands and tissue (Figs 2 FB and 8 FB) are palpated by the first finger and then cut. It will often be found that after cutting the superficial adhesions deeper and denser band firmly uniting the fistula to the descending ramus and symphysis remain. Very often they can be freed from the bone by using the index finger or by palpating with the tip of the scissor and then cutting. Although we prefer palpation and cutting with the scissors if free mobility does not result we have no hesitation in utilizing the first finger with considerable force to break down any connections between the bladder urethra and the posterior surface of the symphysis pubis and descending ramus. Figures 8 and 9 illustrate fibrous band in situ and being cut to provide the necessary mobility.

When the urethra is destroyed special treatment is required in regard to mobilization and in dealing with these cases it is advisable to consider (1) The urethra is a tube for the

conduction of urine from the bladder. Large portions of it can be destroyed but if the remainder can be joined to the bladder perfect function results even if the normal length of the urethra is not restored. (2) Providing one third inch of urethra is available satisfactory reconstruction can be effected. When the upper portion of the urethra is destroyed the remaining portion contracts. After it is completely mobilized it can be elongated to approximately double its length. Even a small fragment of urethra is of value and can be utilized. (3) A successful result will depend on (a) careful planning of the incision (b) special mobilization and (c) suturing.

The description of an actual case will clarify the various points.

CASE 7/3. I at t as a sept para ha g h d 6 n rmal d the 7th a ab m l d l e r y i th baby b m l a l f l l d by incontinence C tract d utlet T to 3 h Op e ti a p f m d Ma ch 93 th ugh a l f t Sch h r t i c f p u e as 100 ac u t f the arr b p u b c a g l e Th i t l a h g h a l b h d d y m p h y s d m t t d r n d x f g l t h d d f t h e r t h d r t y l a n d t h b l l l i l d i c i o n a s m a t a c c l g t d t t l l e i g u r e 5 A r u b b r e t h e t h a l b n j a s s l t h u g h t h r m t s f t h u t h r a t t h e b l l l Th m l d l t h l a s s n l y g t h m i g p t f t h d t r l u t h r a t h d g o f h c h e c l a l y h f r d c i t e j r p o l y l p r a c t e t h d g l l n t b s e n l f r m t h c a t h t r t h d t t d l i e s o b o t h l e s w l l b m o o t h t N t t h t t h i a t o p l n e d s u c h m e t h t t h e m o o t h t u n b t u r d b v t i c a l u t u e v t h c a t h t r (F g 6 b) t h t r u c t g t h t h a Th g h t a d l f t t r m l f l j r e t h r f l t l n l t u e d t t h l b m a (F g 6 a f f) Th i t c t p t n f s t h u r t h r a s t h m b l d p t t h t r n a l m t b b l t l c t u n t l t r l n l p t i r f Th d g f m b l a t f a u t h l l a t h t h a m u t f t h r m i g I t m a y h t h u t h l g b ~ r y l y t m b l t t l y l t r l l y l t h i t e l a r c a l l t m l l a t a c r v W h t h c m p l t t h e s o r s c l d b e p l f m l t t h e n l l p t t h t f t h a n F g r e 6 a C Th t t t l c u t t h a a t m l t t h d t t l l l g 6 Th d c t t i g e r y i d r t h t t t m d a l t t l t t l l m a y b u t l d t h t Th c s o r s h b g g t d c t l t m c o t t b g t h t p h g h p a l t t f t h d p l f t h m l l e d t h l l u t t g t l

both des a d f a l l y d p t t h e t i u e n h i c h t h catheter was eated The b l d e r t h n m o b l i z l The e u l t a a f r l y m b l d u r t h r a a d b l a d d a d j g t h e t o a p e c e o f t i s s u e h i c h a s t f r m t h e u p p o r t i o n o f t h e t h v e r t i c a l L m b t s t r w a s t h e e r t e d c m m c g a t C o n t h e s i d e o f t h e u r e t h r a a n d i n c l u d i n g t h e t o e d g e s f t h t t f r m t h e t a n d l a t e r a l p o r t i o n s o f t h e r e c o n s t r u c t e d u r e t h r a t h e o t t h b l a d d e r a l l a d n d n g a t D F i g u r e 6 F i g u r e 6 b s h o s t h e s u t u r e p a s s i n g f r m c m p l t d u t h r a o n t h e b l a d d e r w a l l A s e c o n d s u p p o r t g L e m b t s u t u r e a s t h e n i s e r t e d P l a t n s s u t u r e s i r e s r t e d t h b l a d d e r l l (F i g 4) T h i r e m r t e d u n t l t h e c a t h e t r w a s a t l g h t f t T h e a g n a l m u c o s a a s t h e l s e d (F i g 6 c)

3 Suture The object of suturing is to make a watertight joint and much depends on the care with which suture particularly the first are applied. Patience and accuracy are essential and if the operator is not satisfied that he has the correct portion of tissue on the needle another attempt should be made. The same accuracy should be aimed for as in an intestinal anastomosis and as the working space is often confined a considerable amount of maneuvering is often required. Around a fistula is an area of fibrosis and this area which is tough and strong should—with as much other tissue as possible—be included in the first suture.

As the edges of a fistula are not excised edge to edge suturing is valueless. The edges must always be inverted with the forceps before the necessary tissue is picked up with the needle.

The standard suture is placed vertically as by this means it is easier to reduce the lumen of a dilated urethra and to plicate the bladder in the region of the new internal sphincter (Fig 4). In irregularly shaped fistulas the sutures have to be placed in the most convenient position. It may be necessary to suture transversely or diagonally and on one occasion a triradiate suture was necessary. Every effort should be made to insert a second Lembert suture or to cover and reinforce the first suture line with borrowed tissue. If this cannot be done the need for the careful incision of the first suture is even more apparent. In high oval fistulas adherent to the rami of the pubis it is advisable to use two sutures and insert suture each angle gradually.

working toward the center where the sutures are tied

LARGE FISTULAS

The size of a fistula is no criterion of its curability. In many cases a large two finger fistula is easier to cure than the small adherent type (Figs 7, 8 and 9)

CASE 46 /39. Patient suffered from constant nocturnal incontinence with birth of a dead baby after 3 days labor. She had had a previous operation. Operation was performed May 9, 1939 through a Schuchardt incision. The fistula admitted fingers with high inside the symphysis distended only to the left and right. The upper two thirds of the urethra was destroyed. Mobilization of bladder in preparation of many dissections and fibrous bands between the symphysis and the bladder to both descending rectum. The uterus and adnexa were absent. No ovarian and uterine tubes. Lymphatic system was removed. The bladder was splicated to provide cover for the bladder from the posterior vaginal wall. Separated from the rectum and distended easily. Results cured.

The accompanying illustrations depict clearly (1) Schuchardt's incision and resulting excellent exposure (2) the free mobilization resulting from thorough freeing of adhesions (3) that large fistulas can be cured if extensive dissection is made.

The internal sphincter and large fistulas. The question will arise—How is sphincteric control resumed after operations on bladder fistulas of large size (1 to 3 fingers) and due to the destruction of a large amount of tissue? The answer is that provided the fistula can be closed and the area at the junction of the urethra and bladder reduced to an optimum size sphincteric control will result. We invariably insert a No. 8 rubber catheter before or after closure of the fistula. Plication sutures in the region of the bladder urethra area are then inserted until a fairly tight fit is obtained. If it is deemed necessary the urethra is then plicated.

CLOSURE OF THE VAGINAL MUCOSA AND PACKING

Interrupted sutures are inserted and if oozing is excessive a small piece of rubber glove is inserted for 4 hours. The vagina is then tightly packed with gauze which is removed after 8 hours.

POSTOPERATIVE TREATMENT

The careful attention to detail is as important as the detail of operation. There are two principles to observe, namely (1) to keep the bladder empty and (2) to keep the stitches clean.

Bladder. We have utilized various mechanical and water pumps for the purpose of keeping the bladder empty and also suprapubic drainage and nursing the patient on the face. None has been completely successful. Such measures require constant and expert supervision. An indwelling catheter connected to a bottle tied to the side of the bed or placed in a bottle between the patient's legs has given us the best results.

Stitches. The vaginal packing is removed after 8 hours and nothing more is done for 3 days—after which and once daily a small bivalve or posterior speculum is inserted into the vagina and the stitch line is exposed—the patient being in Sims' position. The stitch line is then thoroughly syringed with normal saline. A 10 cubic centimeter syringe fitted with an intramuscular needle being used. This method enables the stitch area to be very thoroughly cleaned and is far superior to douching. The vagina is dried with cotton wool and painted with acriflavine and glycerine. Stitches which show signs of infection are removed and the remains or all stitches are removed by the 8th day.

Even when the wound breaks down the regular and methodical cleansing described should be continued and the catheter retained for at least 21 days. A number of our wounds have broken down but with such treatment have eventually healed. Even if this does not happen a clean wound has less resultant fibrosis than a dirty one and a second operation is therefore easier.

If union is good the catheter which is removed daily—cleansed, boiled and replaced—for 10 to 12 days is then removed for periods of 4 hours daily. These periods are increased daily and when the patient is able to retain urine during the whole day the catheter is completely removed. The stay in bed averages 21 days. The catheter is kept in the bladder during the night until daily bladder control is obtained.

WHEN TO PERFORM A SECOND OPERATION
FOLLOWING FAILURE OF THE FIRST

Theoretically the tissues should be in good condition 6 weeks after the first operation. Experience and the following case notes show that contraction goes on for some considerable time after operation and small fistulas tend to heal spontaneously.

CASE 164/38 Operation was performed October 2, 1937. The urethra as chylg Th fistula a ly admitted 2 finger. The ureteric orifices a bl. The rema ts f th crv r f d r. Left Schuchardt's inc n was made. The ntr ur thra as mobilized E te si ed ss ct as ca d t b h d the ymphy s Th bl d d v fe ly mobiliz d. Result failure. Second operation as performed February 8, 1938. Th fistula s rf g r d m t th bl d d r v as prolapsed. The u th n l bladder were mobiliz d. O t ly was poss bl R. It bladd co t ol go i but ther s a pn point fistula in the urethra. March 4, 1938 th fistula had healed p ta ly. Cur d.

CASE 981/37 Operation for rectovaginal fistula lal bec p lo m d Octob r 2, 1937. O p l 4 938 as c nd operation asp r m d Th t l l m t d fng r s Th t ic rifices re bl. Th ethra was y chylg Rem a t f th crv re v s bl but the crv c l l t f d. The nt urethra a m bliz d Th bl d d equ ed f g r l sect b h n l th ymphy s l gn fair a ga d uni b t l b f l r g r l g sph nct r c nt l Ap l 6 93 s l t f d l hstula adm t n f g l t t t r turn 3 m th b t d d t t n t l v a later Op rat sp r f r m d May 25 1938. Th u th n l bladd w m bliz d Th f g f tula h s c t ted t gmp t S t d p l cat n f eth an l b l d l c r d C d.

These two almost identical cases serve to illustrate important points i.e. (1) fistulas resulting from an attempt at repair contract to remarkable degree and no objection is gained by an early second operation. We fix the minimum average date for the second operation at 6 months. (2) pin point fistulas resulting from an operation invariably heal spontaneously.

DETAILS OF OPERATIVE RESULTS

	T	U h ve o- nal				ves l			U h o- ag		
		C d	P cured	I l d	D d	C d	F l d	D l	C d	F l d	D l
Series	5	5	1	1	1						
Series	5	5									
Total	8					5			5		

RESULTS AND PROGNOSIS

Of 33 cases previously reported (Hayes 1937) 6 only were of simple type. In the 1944 series 2 only were simple. The availability of such a large percentage of complicated cases is undoubtedly due to the fact that the large proportion of simple fistulas are easily cured and the failures drift into the larger hospitals. Two patients died. Case 1039/39 of uremia on the 4th day. Case 31/36 of blackwater fever following a very easy operation on a 1/2 inch fistula. In the former patient the fistula was large and the operation difficult. The ureteric orifices were obviously compressed by the sutures and the latter should have been freed on the 2d day. In 5 cases rectovaginal fistulas were present and were operated on prior to the vesicovaginal fistula. In 2 cases the urethra was entirely absent. Three patients presented the unusual feature of complete absence of the uterus and adnexa—proved by intraperitoneal palpation. They all had had long labors and the conclusion is that due to compression and gangrene extrusion of the uterus and adnexa occurred. Eight patients required two operations. Seventy three of 85 patients were cured. The results in 3 cases are described as partial cures having pinpoint or probe fistulas remaining on discharge and patients were advised to return if not cured. Invariably this type will heal spontaneously and as the patients did not return it is reasonable to presume that they healed. If these cases are added to those cured a percentage cure rate of 89.85 per cent is obtained which considering the variety and complications encountered is adequate proof that the flap splitting operation is a satisfactory operative method.

It is interesting to note that we are unable to prognose accurately the result of an operation. Repeatedly we have recorded prog

ABSTRACT OF OPERATIVE RESULTS

	Total	Cured	Failed	Died
Series	5	1	1	1
Total	8			
Cure	85			

nosis bad and the result has been a perfect cure and *vice versa*

amination but invariably make one or more attempts at closure

CASE 26/44 Circumcision of a child
mitted in the Theurthra a / n h lo A
o e f r th o nal fit la w adh r nt to
b th r m f th p b Mobilization s d fficult
a d not c mple On s tue o ly w p s bl
P g o s a b d R s l t c r d

This experience has been fairly common
and we now do not as es operability by ex

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sota M 94 24 637-64
M CKENRO r Zbl Gyn 804 N s p 80
6 TAIT L D ases i W m d abd nal
S g ry i 90-9 Ph lad lph L B th rs C
889

SAPHENOFEMORAL LIGATION WITH THE IMMEDIATE RETROGRADE INJECTION

H O McPHEETERS M D F A C S M n n e p o l s M s t

THE purpose of this paper is to discuss the treatment of varicose veins of the lower extremities by means of preliminary ligation of the offending veins together with either the immediate or subsequent injections of the sclerosing solution.

The discussion is based on an experience gained while doing and caring for 258 ligations in 1952 patients. Of this total number 633 were bilateral ligations. There were 89 cases in which the short or lesser saphenous was ligated. Females predominated 3 to 1, 1904 females to 678 males. This preponderance of females is explained by the fact that many women come for treatment for cosmetic reasons only, while most men come only when the pain and ache in the leg is severe or when a definite thrombophlebitis has developed. When the varicose condition involves only one leg it shows no predilection for either—right 1307 left 1275.

As to age groups we found the large number of cases in the decade between 50 to 60 years 33 per cent, with the next in the 40 to 50 year group 30.6 per cent, 13 patients were under 20 years 7 per cent, 49 patients 70 to 80 years old 2.9 per cent, and 1 patient was 81 years old.

The normal upward venous flow is carried on by three main factors. First the pressure of the arterial blood through the capillaries and into the veins, second the pumping effect of the calf muscles as they contract on the deep veins while the patient is walking, third the suction force of respiration which causes a negative pressure in the chest during inspiration.

The theory that the preliminary ligation is the first and perhaps the most essential step in the treatment is based on the now proved fact that the flow of blood in any well developed case of varicose veins is actually retrograde; that is, it is flowing downward toward the foot

instead of toward the heart as should be the case with all venous blood. The more marked and well developed this flow has become the more important it is that the ligation be the first step in the treatment.

The reverse flow of the blood develops because of the loss of function of the valves in the veins in the thigh and lower leg. There are usually 5 to 7 sets in the great saphenous through the thigh with one set just outside the saphenofemoral junction and at times one set in the deep femoral and iliac vein just above. There are several sets in the veins of the lower leg.

The loss of valve function develops for several reasons. First and I believe foremost a hereditary factor is present in fully 50 per cent of the cases. By this I mean the patient is born with a weaker than normal set of vein wall through some sections. Under the stress of normal life exercise work with its attendant straining and the increase of intra-abdominal pressure etc. these vein walls stretch and give way so that the vein lumen may become several times larger than normal. Thus the valves will be mere cusps on the side of the vein wall and of little value. Careful taking of histories has often shown this to be the case. The second most common cause is infections. During sickness there has actually been a bacteriemia with the infection causing damage to the valves and scattered areas of the vein wall. The weakened wall dilates under the usual venous pressure and then more rapidly later when the valve function is lost. The third most common cause is pregnancy (10). Many have argued that the growth of the uterus mechanically causes pressure on the iliac veins and that the normal veins below just give way under this strain. This is not the usual case for the varicose veins most often begin during the first 3 months of pregnancy when the fundus is still small and freely movable in the pelvis. There is much evidence

to prove that there is actually a disturbance of the hormones (11) with an overdevelopment of some such as progesterone which permits the muscles of the vein walls to soften and stretch (10). Fourth there is the case of congenital varicose veins and the arteriovenous fistulas. These anomalies are recognized soon after birth or during the early months or years of life. They are most difficult to treat.

What varicose veins should be ligated? The patient with small varicose veins the size of a lead pencil with a very slight or no reverse flow can well be treated with simple injections. Any patient who does have a well developed reverse flow should be studied and then a ligation block should be made above that point wherever it may be. Many surgeons believe that any vein large enough to be injected should be ligated first. In my opinion this is too radical for with proper selection fine results have been obtained in many hundreds of cases over a period of years. Personally it would seem that any vein that has been injected with care and there has been a recurrence should be ligated. Any great saphenous 1 centimeter or larger in diameter at the saphenofemoral junction or the short saphenous the same size at its junction with the popliteal vein should be ligated. Any vein with a definite reverse flow through a perforating vein and which does not come from the saphenofemoral junction should be ligated where found. The possibility of the presence of compensatory dilated veins must always be thought of and especially so after a history of phlebitis. Compensatory veins may develop following a blockage of the deep system but after the deep veins heal and become recanalized and again are patent and functioning we should study the varicosities present and if they show the finding of typical varicose veins with a marked percussion pulse (14) PPT (Fig. 1) at the groin and a reverse flow they should be ligated and injected just the same as any other varicose vein in any individual.

The Trendelenburg (17) test is the one most commonly used to determine reverse flow (13). It is simple and easily done. With the patient standing the varicose condition is studied. The percussion pulse is followed along the

vein to the groin. The patient then lies down and the leg is elevated to empty the varicosities. Pressure is then made over the saphenofemoral junction to block any outward flow. The patient then stands. If there is a marked reverse flow from the groin when the pressure is suddenly released the empty varicosities will fill rapidly and the test is positive.

If the varicosities fill slowly with the normal accumulation of blood from the distal area but fill more rapidly when the pressure at the groin is released then the test is still positive. We also have the condition in which the reverse flow is outward through a perforating vein in the thigh or lower leg. In this case the vein will fill rapidly and not become more tense when the pressure above is removed. This is a negative test. Then there are cases which have some of the reverse outward and downward flow from both sources. This is called a Trendelenburg double test.

The Perthe test is the one most commonly used to locate a reverse flow through a perforating vein in the lower thigh. It is made by applying a rubber tube tourniquet about the leg and having the patient walk rapidly for 50 to 100 steps. The normal pumping effect of the calf muscles with each step will suck the blood inward from the varicosities and thus the varicose segments above the tourniquet will remain filled while those below will be emptied. If the test is positive the empty veins will quickly fill from above as the tourniquet is removed. The multiple tourniquet test of Oschner and Mahorner (9) is merely the reapplication of the Perthe test at different levels until the offending vein or veins are located. Gerald H. Pratt uses two bandages about the leg to locate the perforating vein. They work well. One bandage is applied very tightly from the foot to the groin. When the patient stands it is removed from the top down. A second bandage is then applied from the groin downward leaving about 4 inches between the bandages. In this way the perforating veins can be seen as they appear. If the test is negative and the large varicosities are compensatory veins then the veins below the tourniquet will enlarge as the patient walks rapidly and the patient will complain of pain in those areas and the lower leg.

The bandage test is the final proof as to whether the enlarged veins are varicose or compensatory. It should be used on all cases that are not clear with the other tests. Here a firm 4 inch bandage (the Ace No. 1 four inches wide has been found to be most satisfactory) is applied about the lower leg from the knee down to the toes going twice about the ankle and foot in a figure of eight. The patient is then told to walk four to five blocks very fast. If the patient should develop a pain in the lower leg and in particular if this should increase then he may remove the bandage but if the pain does not increase as the minutes go by then he should walk three blocks rest walk four blocks rest walk five blocks and then report back to the office for examination with the bandage still applied. If the pain should get better then he is to leave it on until bed time when it can be removed if uncomfortable. If the varicosities are compensatory the patient will have severe pains through the lower leg and foot when walking but if they are typical varicose veins with a stagnant and reverse flow the patient will feel better the faster he walks and when he returns after a fast ten block walk his toes will be pink the edematous leg will be much softer and the patient will admit that the leg feels better than it has for a long time. Many doctors do not grasp the mechanics of the compression bandage and the pumping effect of the calf muscles on walking. Many patients have actually been told never to wear a tight bandage on that leg. It is a common thing for a doctor to let the patient dominate the situation and when the patient says I do not like the bandage etc. he is permitted to go without the support even though the lower leg may be edematous and badly swollen. When the patient has had this kind of treatment in the past I admit that it is a case of salesman hip to persuade him even to try wearing a bandage on the lower leg long enough to make a good test let alone for treatment of an inflamed edematous leg with ulcerations. Again the doctor must decide whether there is evidence that the patient has pain or whether it is a case of fear on the part of the patient and lack of confidence in the present attending physician.

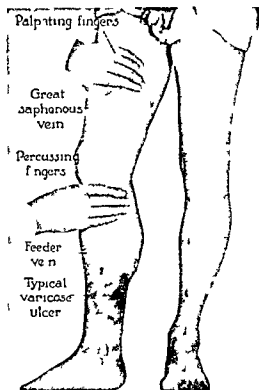


Fig. D m. trat. g th. pe cu. p l. t. m t t f.
th. P P T N t th. typ. lly f ed g th. r i o s e
l. Th. g. t saph. t. l l. p l p b l i. th.
th gh. p t at th. p o t m. k ed. Th. p e cuss. m p l s e
m d by th. f g r s t th. k. t. t t d p. d a d
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m t f l. t t p e th gh. (f m th r f j j. t o n T t
d Hem h d.)

At the time of examination we must not only settle the question of the reverse flow and that a ligation or ligations should be done but we must not forget the patient himself. How often we see a patient die of shock from a burn while the doctor is meticulously caring for the burned area itself in order to avoid a later infection if the patient lives. So here we must always be on the lookout for a complicating diabetes for a cardiorenal condition and for the presence of a very toxic thyroid with the varicose veins by far a secondary factor.

The diabetic patient stand surgery poorly until he is insulinized the decompensated heart patient should be digitalized and then he will gain much relief from the care of the varicose veins. The worry and pain of bilateral ligation with an excessive reaction may

to prove that there is actually a disturbance of the hormone (11) with an overdevelopment of some such as progesterone which permits the muscles of the vein walls to soften and stretch (10). Fourth there is the case of congenital varicose veins and the arteriovenous fistulas. These anomalies are recognized soon after birth or during the early months or years of life. They are most difficult to treat.

What varicose veins should be ligated? The patient with small varicose veins the size of a lead pencil with a very slight or no reverse flow can well be treated with simple injections. Any patient who does have a well developed reverse flow should be studied and then a ligation block should be made above that point wherever it may be. Many surgeons believe that any vein large enough to be injected should be ligated first. In my opinion this is too radical for with proper selection fine results have been obtained in many hundreds of cases over a period of years. Personally it would seem that any vein that has been injected with care and there has been a recurrence should be ligated. Any great saphenous 1 centimeter or larger in diameter at the saphenofemoral junction or the short saphenous the same size at its junction with the popliteal vein should be ligated. Any vein with a definite reverse flow through a perforating vein and which does not come from the saphenofemoral junction should be ligated where found. The possibility of the presence of compensatory dilated veins must always be thought of and especially so after a history of phlebitis. Compensatory veins may develop following a blockage of the deep system but after the deep veins heal and become recanalized and again are patent and functioning we should study the varicosities present and if they show the findings of typical varicose veins with a marked percussion pulse (14) P.P.T. (Fig. 1) at the groin and a reverse flow they should be ligated and injected just the same as any other varicose vein in any individual.

The Trendelenburg (17) test is the one most commonly used to determine reverse flow (14). It is simple and easily done. With the patient standing the varicose condition is studied. The percussion pulse is followed along the

vein to the groin. The patient then lies down and the leg is elevated to empty the varicosities. Pressure is then made over the saphenofemoral junction to block any outward flow. The patient then stands. If there is a marked reverse flow from the groin when the pressure is suddenly released the empty varicosities will fill rapidly and the test is positive.

If the varicosities fill slowly with the normal accumulation of blood from the distal area but fill more rapidly when the pressure at the groin is released then the test is still positive. We also have the condition in which the reverse flow is outward through a perforating vein in the thigh or lower leg. In this case the vein will fill rapidly and not become more tense when the pressure above is removed. This is a negative test. Then there are cases which have some of the reverse outward and downward flow from both sources. This is called a Trendelenburg double test.

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Fig 1 ft \ t l m k g l g t saph
t gr Tra se m k h l f
fi g b eadth bel th l lf ld b l ci th gh
th f sc l h th g th g t ph

mark is best made by a simple scratch with the back of the tip of a scalpel. If you warn the patient of it and do not press hard he will mind it but little. Additional marks are made lower in the thigh or lower leg if other locations are to be done there.

I preferably the leg should be draped epa- rately so that it may be raised high from the table without contamination. If bilateral li- gation is being done both legs are so draped. One per cent novocain is infiltrated through the area care being used to carry it widely enough to give good anesthesia.

After the skin and superficial fascia have been incised a secondary infiltration is made of the deeper layers. As the dissection is carried downward and about the saphenous vein injection should be made all o into the posterior sheath of the vein as soon as possible as the sheath carries nerves and the patient otherwise will complain. Two or 3 cubic centi- meters of novocain is then injected about the vein just at the foramen. If care as to the injection is used the ligation can be done with little or no pain and with much surprise and pleasure on the part of the patient. As a rule about 90 cubic centimeters of novocain is used for each side.

The incision should be adequate about 3 inches longer in the oblique individual. As Ju- lid (7) so aptly said incisions heal from side to side and not end to end. A short incision predisposes to incomplete work and makes the chances for technical complications far greater.

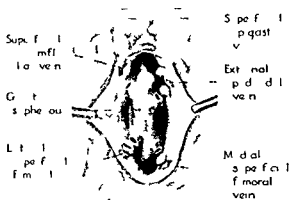


Fig 3 F sc l h th h s bee pe ed d stripped ff
Th d ll b hesh bee lg ted sep t ly Th
g t ph t d dy t be l amped d

It is these avoidable complications that cause calamities in this work and we should try to prevent them.

Dissection carried out directly down and under the preoperative scratch mark will reveal the vein. The vein can also be located just internal to the pulsations of the femoral artery or in the soft triangle between the heads of the sartorius and the adductor longus muscles. It is very simple to open the sheath and to peel it off the vein. The peeling process should be done from inside the sheath and more novocain should be injected as the sheath is peeled off (Fig 2 and 3).

As a rule the vein is found about 2 inches below the saphenofemoral junction. During the dissection stage it is important not to use forceps with teeth as so often the vein wall is thin and is easily torn. The vein is lifted up and a curved Mixter cystic duct clamp is slipped under it. A clamp is then placed on the vein distally and the curved clamp proxi- mally. The vein is sectioned a stump one half to three quarters inch being left on the distal end. This stump will facilitate the injections later.

The fat is retracted upward and the proxi- mal stump is followed to the wall of the femo- ral vein. All branches are carefully located. This is very important and the dissection must be carried upward and into the foramen so that the femoral vein can be seen both above and below. Often times branches come off di- rectly at the foramen (3, 12) (Fig 4). Usually

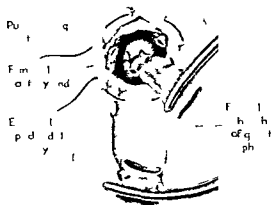


Fig 4 G t saph t u ed th lamps both
p xim l d d t a l d \ t th t n b t a r y t n
th saph in th f r a m E a h p t l y l i g t e d
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t h f m r a l A p r s t r i g l i a t r e h a b e p l a c e d
t i n f t h f m t h t u m p i s t c k e d i n. T h
t r a n a l p d d l t r y l e s b e l w t h f m i n b o t
o o p e t f t h c a s e s

there are three branches in the last one half inch of the saphenous vein. No 40 cotton is used for these ligations. The presence of the small external pudendal artery is a good landmark as to the location of the foramen. The artery lies just below or above the saphenous vein at the level of the foramen and often may be double going both above and below. It should be ligated if it is in the way.

The femoral artery with its pulsation is located just external and can easily be injured with careless clamping of the artery forcep. Often when the clamp or ligature slips off the proximal vein stump profuse hemorrhage develops. In most instances amputation following ligation has been the direct result of this injury from clamp or forceps with resultant thrombus formation and arterial blockage. This statement is made after autopsy in 2 cases and after careful study of case histories from attending surgeons in several other cases.

A No 16 cotton ligature is placed about the proximal stump full and flush with the wall of the femoral vein. A second ligature of No 16 cotton single is then tied about the same stump as a double precaution against post-

operative hemorrhage. I have had this experience. Some prefer to transect the vein. That is all right. I prefer to use the two separate ligatures and leave a longer stump of vein. In this way there is no proximal stump from which an embolus could come. At least three-fourths to one inch is left distal to the ligature thus eliminating worry about the ligature slipping off the end.

A pursestring ligature of No 16 cotton is placed about the foramen (Fig 5) so as to close the fat and fascia over it and thus to reinforce a weak spot in the fascial plane over the femoral vein the same as we would do with a femoral hernia. Most men do not bother with this step but I think it is just good surgery to reinforce a weak spot in the deep fascia. It just lessens the possibility of a recurrence through a small branch that may be left even with real care.

The distal stump of the vein is then picked up with small forceps. A No 16 cotton ligature is placed about the vein distal to the clamp. With the forcep on the vein stump in one hand a cannula on a syringe containing the sclerosing solution is then slipped into the open end of the vein the clamp is removed and the ligature tied all at the same time.

The patient is then tipped into a marked Trendelenburg position and the foot and leg are raised high for about 1 minute so as to drain all the blood from the varicose veins through the communicating veins into the deep system. The table and patient are then quickly tilted into the reverse Trendelenburg position with the leg still held high. The leg is then quickly dropped to the table and two-thirds of the solution is injected. Since the varicose veins are now empty and collapsed the solution will drain down and spread widely through the branches to the calf and at times to the ankle. After 1 to 2 minutes the table is returned to about 10 degrees off the horizontal and the rest of the solution is injected. The wound is washed with normal saline to free it of any sclerosing solution that might have been pulled during the injections. It is then closed with two sutures of No 16 cotton and the skin with dermal. Mastasol helps keep the dressing in place and furnishes a better protection.

As soon as the wound is dressed separate strips of adhesive are applied over the large segments of varices so that as the thrombus develops during the next 24 hours it will be kept as small as possible. A large thrombus will liquefy and recanalize while a small one will organize with a good result.

Immediately following the operation the patient must walk rapidly the equivalent of one block. He can then dress and go home but must walk 5 minutes out of every hour until 10:00 p.m. of the day of operation. He is given some sort of sedative capsules for the moderate pain he will have and told to take them as needed and to report to the office for a dressing 2 days later. That visit is very important for his comfort. If the reaction through the thigh is severe the thigh should be strapped with elastic adhesive for support. If severe in the lower leg then a firm 4 inch bandage from the knee to and about the foot will give much relief. Patient must continue to walk some every 3 to 4 hours during this time.

The sutures are removed at the end of a week, and either then or at a later date the injections of the remaining patent varicose segments are begun. If the reaction has been severe there is no harm to wait until it has subsided. But it is very important that the follow-up injections be continued until all the varices are firm and hard. Usually the injections are given every 1 or 2 weeks and 3 to 6 at a time. These are of $\frac{1}{4}$ to $\frac{1}{2}$ cubic centimeter of the same sclerosing solution. Immediately following each set of injections the patient must walk fast 3 to 5 blocks and then at frequent intervals all day long.

PREGNANCY AND LIGATION

The treatment of varicose veins during pregnancy except in the isolated case does not seem justifiable. At times much relief can be given by a few injections. During pregnancy the injection of the feeder vein into a large and rapidly forming burst is always indicated to relieve pain and to prevent the formation of the unhealthy condition—a condition that cannot be completely cleared once it fully develops. The ligation of the varicose veins during pregnancy has been one hundred per

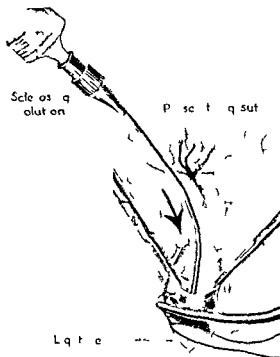


Fig. 5. The sclerosing solution is injected into the patent vein. The injection is made into the vein at the point of ligation.

cent failure and is not recommended. These patients should be treated palliatively with the injection as indicated and they should wear a firm 4 inch ace bandage during the day and remove it at night.

COMPLICATIONS

Complications are best divided into those of the operation itself and those of the postoperative period.

The most common and serious complication that can and may develop during the operation is a hemorrhage. Hemorrhage may come from the tearing of a large dilated saccular thin walled vein during the dissection. It can best be avoided by not using forceps or clamps with teeth. Personally I am very careful that no such instruments are ever on the table. Another common cause of hemorrhage is the slipping of the forceps on the proximal stump during dissection or slipping of the ligature after it has been tied. The first

can happen to any surgeon but the latter can be avoided if the care already discussed when the ligatures are applied is exercised.

If the proximal stump does become loose either from a poor forcep or a slipped ligature where the vein is the size of the thumb the surgeon is faced with a real problem. The patient is usually nervous and straining. They sense that something has gone wrong and they become more worried and tense. The blood boils up from the bottom of the wound as from a spring. Here the potential source of calamity and the principal reason of a good operating room. The surgeon should keep calm and quickly place a large sponge in the wound with pressure and tip the table into a marked Trendelenburg position. Of course the shoulder supports have been applied as they always should be. The leg is raised straight up and the table, patient and leg are held in this position for minutes. It is surprising to find that after that length of time the leg can be lowered to the table, the pressure removed from the wound and there will be but little bleeding. The proximal stump is now carefully sponged and picked up and the operation continued. As soon as the stump has been reclamped the table may be leveled again.

If a postoperative hemorrhage should develop after the patient leaves the hospital I would insist on his lying quiet while someone quickly places a clean towel over the area and maintains constant severe pressure until the patient can be taken by ambulance to the hospital and operating table. It should be remembered that pressure and bandage will stop any hemorrhage. The wound should be reopened and cared for as described.

CASE. A 40 year old male patient with a history of high blood pressure and a recent diagnosis of aortic aneurysm. He had been under medical treatment for several months but the condition had worsened. He was brought to the hospital by ambulance.

CASE. The patient was a 40 year old male with a history of high blood pressure and a recent diagnosis of aortic aneurysm. He had been under medical treatment for several months but the condition had worsened. He was brought to the hospital by ambulance.

At the time of the operation the femoral artery was found to be an abnormally large vessel, about the size of the thumb. It was found to be an anastomosis of the femoral artery and the femoral vein. The operation was completed under gas anesthesia and the other side was ligated. The second side progressed as usual while after 2 years of hospitalization and ligation an amputation through the lower thigh was made of the first side.

Gangrene of an extremity can happen only from a loss of the arterial supply. Gangrene could not happen as a result of the retrograde injection at the time of the ligation as the injection is made into the returning side of the circulatory tree. The injected fluid could not get across into the arterial side by any conceivable route. It would seem that those who argue that it can do not reason out the route and direction of the blood flow in the arterial capillary and venous portions of the circulation. A knowledge of the blood pressure readings found in the different areas would prove the fallacy of the idea.

The greatest source of morbidity in this series as also with those patients seen after operation in consultation has been the severe chemical phlebitis and the associated cellulitis following the injections of too large amount of the sclerosing solution. By the use of the tilt technique described by the individual

izing of each case and by the injections of the smallest amount of the weakest sclerosing solution that will give a sufficient reaction to produce the obliteration of the varices this source of morbidity can be reduced to a minimum.

The excessive phlebitis and painful reaction are best cared for by bed rest with the application of hot packs applied widely over the area for 4 hours at a time with the patient getting up for a 5 minute walk twice daily. This regimen will cause a rapid relief of the pain and yet prevent the stasis thrombus extension and embolus formation attendant upon steady bed rest (6). I have seen and have had cases in which the lower leg and even the entire thigh were swollen after operation. This condition in my opinion was due to too much solution having been injected and to the patient not walking sufficiently to wash the sclerosing solution thoroughly from the deep veins after he left the operating room. Thus the same finding would be found as in deep phlebitis. Fortunately I have never seen a single case in which swelling persisted after treatment of the great saphenous and in only 3 cases after ligation and injection of the short saphenous.

Any method of treatment for a certain condition is just as good as the results obtained. Time did not permit the collection of follow-up data and statistics on my entire series of cases. However a complete check was made on my first 146 cases but the information was reported on only those cases in which ligation had been done 1 year or more previously. The data would be almost exactly the same if a complete check were made today except that there would be a definite improvement in the results.

Any discussion of the end results and recurrence must take into consideration the path of the present in varicose veins. It is essentially one of degeneration or the result of damage and injury that may have been sustained years before. If that process and those factors whatever they may be are still active more varicose veins are bound to develop as time goes by. The yearly visit to the dentist is made with the full expectation that new cavities will be found and cared for. Just so

with varicose veins. We must realize that time takes its toll and that the yearly visit to the doctor will probably show new varicosities forming. Just as with the teeth this may be a progression of the old process not completely checked or it may be an entirely new condition. We do know that in the average case one or two visits to the doctor a year will be sufficient to keep the varicose state well under control and to prevent a reformation of the extensive varicosities present when the patient was first seen.

SUMMARY

This presentation is based on an experience gained in caring for 258 varicose vein ligations over a period of 12 years.

Every method based on sound reasoning has been tried and conclusion has been reached that the *high saphenofemoral ligation* combined with either the immediate or subsequent injection of a sclerosing solution has given uniformly good results. In any case of varicose veins with a definite reverse flow high saphenofemoral ligation is by far and wide the method of choice.

CONVICTIONS CONFIRMED

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San I c c Ih r c g ed lairs and ut
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re It su ly does r d ce the mo nt of venous bleed g at the t me of the ope t n The cl n cal e d re ult r f e d th p t n ts re urp is ngly comfo table aft oper ton

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COCLUSIO S

The e a m n y c a e o f v r c o v e i n s n t a l l e c t e n t h e m d i v d a l 2 M n v c a s a r b e s t e x p l i e d b y c n g e n t l w e a k e s r d e f i c n e y o f t h e n w l l n s c a t t e r l a a s M n v h a v e t h s s m e k n e s s d e v l p f o l l o n g d a m a g t o t h e i a l l d a l e s b y a p h l b t

3 The h o r m o e t h r y (10) a s c u s f a r c o s e n s m u s t b e m o e t h o u g h l y x p l o d d t e s t d 4 The p r e s e c f i n c o m p t t p e r f r t g r r m u n i c a t g v n s o n c a e o f t h c u e c e m u s t b e c e p t e d T h f i o t. o H o m a n (4) P r a t t L t o n O h e r (9) S h e r m a a n d t h e r c o m p e t n t m n m t b e e c e d

5 F i n a l l y t h e g e t m a j o r i t y o f c a s e s a r b e t p l i n d n t h e b a f d e g n a t e c n d i t i o n d e v e l o p n g t h e v e n w l l m a r t t h e d c a c f t e c t h t h d e l o p m n t f g v h r f a t f e t h r f o r m a t h e m o r r h o d t e O n t h t h r y c a n d m o s t e p o c t m o i c o s e s t f o r m a d d l p a s t h e y e a r s b y r e g r d l s f h w t h o g h t h e p e a t e m l m h v e b n I n m y p e r o l e p e r n e i c e e i n s h d e l o p e d n f t r t h b s t n d m s t h o u g h p e t i e p o c e d u r B u t j u s t a t h e d e t t w i l l c a f a n d r p a a s t f t e t h d i l y n e g l c t e d t h r o u g h t h y r s a n d t h n t l l t h p a t i e t t o r t u r n e v e r y a t h a n c a t i e f i l l e d h l e m l l o m u t t h e r g t r e a t

h i s p t t w i t h r i c o s e H m u t d t b e s t w o l h e c a n f r t h e i n d u a l c a e t h a t u s n g t h e b s t t h o j a d a p t b l a s e g r d t h r g i c a l p h s e a d c m b e w t h t s m f m f t h e j e c t o n t r i m n t W h e n t h e e s u l t s f e t h t p t e n t i d c h a g e d w i t h t h e i n s t r u c t i o n s t h a t n r c o s t i l l p o b a b l y f r m a t h e y e a r s g b n d t h a t h s h o l d r t n e r y y e a t h a t h e s e c a r d f o r t h e m e r e u f a f e j c t i b l t h e r i c o s v e a r s m a l l o t h t t h f e s h o b t a i n d t h o u g h m u c h l a b r w l l b r e t a d

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- 4 H O M A J O H S g G y n O b t 906 43
- 5 I d m C u l a t r y D f t h E t r m t e s \
- 6 H T E W R R L C S E V i T O N D R f
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- 8 L T O P R A n s g 938 7 58
- 9 M A R O T E H R d O E R A 1 5 g
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- 11 I d m W e s t J S g 943 6 99-100
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- 19 S H E R M A R S T O A n s g 944 77
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ABSORBABLE GELATIN SPONGE AND THROMBIN FOR HEMOSTASIS IN NEUROSURGERY

Experimental and Clinical Observations

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THE introduction by Ingraham and Bailey (2 3 4) of fibrin foam prepared from human blood as an absorbable medium for the application of human thrombin constituted an important advance in technical neurosurgery. Recently Correll and Wise have developed a foam like sponge whose essential ingredient is gelatin. When dry this sponge can be cut into sheets or pledgets of any desired thickness and dimensions it absorbs liquids readily and its tensile strength and other physical properties make it easy to handle without fragmentation in either the dry or wet state. It has the additional advantage of being produced from a readily available substance by a simple and inexpensive process.

The use of this sponge as a hemostatic agent in neurosurgery has been carefully investigated by Light and Prentice (6) in monkeys. They found that the gelatin sponge is readily absorbable and that it has no significant toxic or irritative effects. In these respects it was comparable to fibrin foam.

Subsequently Light (5) employed the gelatin sponge in conjunction with bovine thrombin in a series of human neurosurgical operations. As a hemostatic agent the sponge proved quite satisfactory and no harmful effects of any kind were noted.

We have carried out experiments on dogs in which the efficacy of gelatin sponge has been determined and its absorption and replacement have been studied histologically. In all experiments identical observations were made upon fibrin foam as a similar medium of already established value and safety.

Concomitantly gelatin sponge has been employed in a number of human neurosurgical operations by a group of neurosurgeons who have been kind enough to forward reports on these cases to us for analysis.

EXPERIMENTAL OBSERVATIONS

Identical procedures were carried out on all dogs with routine neurosurgical technique. Under intravenous nembutal anesthesia the superior longitudinal sinus was exposed and two incisions about 1 millimeter in length made in it. A small pledget of fibrin foam saturated with human thrombin solution was placed upon one bleeding point covered with moist cotton suction applied for a few seconds and the foam gently held in position for a few more seconds. The cotton was then removed and the foam left in place. Upon the second bleeding point a piece of gelatin sponge of the same size saturated with human thrombin was placed in exactly the same manner. The wound was then closed in layers with interrupted silk sutures.

In all instances there was immediate and complete cessation of bleeding when either the foam or gelatin sponge was employed. The two materials seemed equally satisfactory in this regard. Because of its physical properties the gelatin sponge was easier to cut into the desired size and had less tendency to crumble.

The dogs recovered promptly and none showed evidence of toxic or anemic reaction.

The animals were sacrificed in pairs at intervals of 2 days 4 days 1 week 2 weeks 4 weeks and 6 weeks after operation. The areas in which foam and sponge had been applied were somewhat adherent to the overlying tissues and the foam and sponge (or in longer experiments the fibrous tissue with which they had been replaced) were firmly adherent.

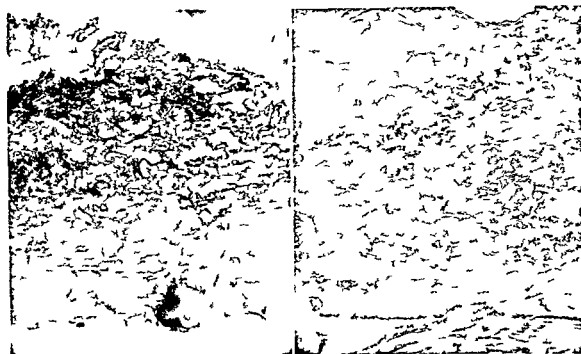
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Figs 1-4. Tissue ingrowth into the sponge. 1: 1st day post-implantation; 2: 3rd day post-implantation; 3: 7th day post-implantation; 4: 14th day post-implantation. (H&E, $\times 7$)



Figs 5-8. Tissue ingrowth into the sponge. 5: 1st day post-implantation; 6: 3rd day post-implantation; 7: 7th day post-implantation; 8: 14th day post-implantation. (H&E, $\times 7$)

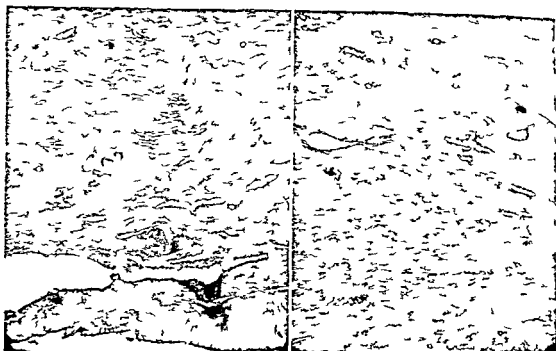


Fig 5 S k ft m p l t t l f t G l t p o g b h t f i b f a m D n s l t t i l g
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to the underlying dura. The longitudinal sinus was found to be patent in all animals. The areas of dura upon which the sponge and foam had been placed were removed, fixed in 10 per cent formalin and sectioned for histological study.

Microscopically the reaction to the two substances and their time of disappearance were quite similar. Comparable sections at the various intervals are shown in the accompanying photomicrographs.

There was an early infiltration of polymorphonuclear leucocytes. The infiltration involved the spaces in the sponge or foam previously filled with fibrin (Fig 1). Some times there developed a leucocytic mass between dura and foam with less infiltration into the foam itself, as though the latter were relatively impermeable to the cells (Fig 2 b).

By the end of one week (Fig 3) infiltration of fibroblasts and round cells was replacing the early inflammatory change and this process was more pronounced at 2 weeks (Fig 3). At the latter stage considerable absorption of

both foam and sponge had taken place and new blood vessels were producing a phase of granulation.

At 4 weeks both sponge and foam had completely disappeared except for tiny isolated fragments which were surrounded by a mild inflammatory reaction (Fig 4). Young blood vessels were still present but the fibrous tissue was growing more dense. At 6 weeks the sites of implantation of foam and sponge were almost completely healed with the formation of plaques of moderately dense elastic tissue (Fig 5).

In general the reaction to these materials was little if any more marked than would have been associated with the absorption of a simple hematoma of comparable size. No significant difference between the reactions to the foam and the sponge was detected.

CLINICAL OBSERVATIONS

Reports on the use of gelatin sponge in a total of 272 neurosurgical operations have been received from Dr Edwin Boldrey, Dr

THE VALUE OF GELATIN SPONGE AND HUMAN THROMBIN IN NEUROSURGERY

Cases	Tissue	Resist		Comparison with fibrin foam			
		Good	Not so	Not so	Not so	Not so	Equivalent
Coleman					5		
Craig	7			3			
Davis							
Fincher	5	5		5			
Howard		5		6	6		
Naffziger	3						8
Poppen							
Sachs	6	6					
Swanson	3			6			
Woodhall				8			7
Woodhall							
Total		5	8				

Claude Coleman Dr William Cone Captain William Craig Dr Loyd Davis Dr Edgar Fincher Dr Gilbert Horrax Dr Howard Naffziger Dr Wilder Lenfield Dr J L Poppen Dr Bronson Ray Dr Ernest Sachs Dr Homer Swanson Captain B B Whitcomb Lieutenant Colonel Barnes Woodhall and ourselves. In 115 of these procedures fibrin foam was also employed for comparative purposes. Human thrombin was employed exclusively since it was desired not to introduce any additional factor which might influence evaluation of the sponge.

The reports have been submitted soon after the operative procedures and have presented the surgeons' impressions of the value of gelatin sponge saturated with a solution of thrombin as a hemostatic agent. However, in extensive correspondence no harmful late effects have been reported and in our own case none have been observed.

The sponge has proved most useful in the control of epidural venous bleeding particularly under the bone edge adjacent to an osteoplastic flap of diffuse oozing in a tumor bed, epidural bleeding in the spinal canal and in the preparation of a dry bed for a

sutured peripheral nerve. Arterial bleeding is seldom controlled unless in such a position that pressure can be maintained.

A summary of the reports received appears in the accompanying table. Every investigator has found the sponge to be satisfactory in the great majority of his cases and has expressed a highly favorable opinion regarding its usefulness. In 5 of the 8 instances in which it has been reported unsatisfactory the investigator offered a reason not attributable to the sponge to explain the poor result.

The opinions expressing greater satisfaction with gelatin sponge than with fibrin foam are based entirely not on the failure of the latter to effect hemostasis but on the greater ease of handling the sponge. It has no tendency to crumble or fragment, can be cut with a knife or scissors when either wet or dry and retains excellent tensile strength when wet. In only 3 of 115 cases did the surgeon consider the sponge inferior to fibrin foam. It was considered superior in 70 cases but equally satisfactory in 42.

CONCLUSIONS

In view of the observations of Light (3, 6) and of the results reported herein it seems justifiable to conclude that absorbable gelatin sponge is a safe and efficacious medium for the application of thrombin in the control of venous bleeding in neurosurgical operations. It is usually easier to handle than fibrin foam and it can be produced in quantity by a simple process from a plentiful and inexpensive substance.

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EXCISION OF THE FRACTURED PATELLA

ADOLPH A SCHMIDT M.D. M.J. M.C. AUSTIN, Callosa Albion

BECAUSE of its prominent position at the anterior aspect of the knee the patella is vulnerable in direct as well as indirect injuries to the knee. In direct injuries such as a fall on the flexed knee the patella is particularly prone to fracture. In indirect injury such as a sudden violent contraction of the quadriceps one of four types of defect may occur to cause a disruption of the extensor mechanism of the knee. The patella may fracture the quadriceps or patellar tendons may rupture or the tibial tubercle may become avulsed.

Our particular consideration at present is with the fractured patella. Therapy in the other three instances is clear cut. Avulsed tibial tubercles are readily reduced and may be fixed in position by a screw. Ruptures of the quadriceps or patellar tendon require open operation for repair. The end results in all three of the instances are usually good without disabling sequelae.

THERAPEUTIC PROCEDURES FOR FRACTURED PATELLAE

In the case of the fractured patella however therapeutic procedures are not uniform. Many of the following have been used:

1 Rest in bed with adhesive strapping to coapt the patellar fragment

Plaster-of-Paris immobilization

3 Percutaneous circumferential wiring of the patella with flexible stainless steel wire acting as a pursestring suture

4 Kirschner wires drilled percutaneously in crucial fashion through the patellar fragments to immobilize them

5 Open reduction with suture of patellar fragment and quadriceps tendinous expansions. Catgut silk linen fascia lata kangaroo tendon and wire have been employed as suture material

6 Open reduction and fixation of the fragments with nail screw or plate

7 Bone graft in cases of nonunion

8 Partial excision with suture of the involved quadriceps or patellar tendon to the remaining fragment

9 Complete excision of the patella

The mere fact that so many types of treatment have been employed is an indication of the lack of satisfaction with any one of them.

Disadvantages of closed or open reduction Since the beginning of the 19th century open reduction has been the method of choice in treating fractures of the patella with displacement. The incidence of nonunion and fibrous union has been much greater with closed reduction than with the open method. However even with the latter bony union is not always obtained. The result did improve after particular care was taken to repair the lacerated quadriceps expansion. But even then nonunion and fibrous union have been too frequent. This fact produces a sense of insecurity in the involved knee particularly when walking stairs. Some form of external support is often required to control this instability. Frequently in cases with fibrous union and even with bony union refracture occurs whether treated originally by closed or open reduction. It has been reported that 10 per cent of fractured patellae refracture. The recurrence may take place without actual trauma but merely following strong sudden contraction of the quadriceps. The majority occur within the first year but they may occur several years later. A further complication is the malunion of fractured patellae. In many cases the patellar fragments unite with some irregularity of the articular surface. Arthritic changes develop with painful restricted mobility and weak undependable knee. At times it is necessary secondarily to remove the wire suture or even the patella.

Excision of the patella In view of the complicating sequelae noted which may follow open as well as closed attempts to obtain bony union excision of the patella has become a popular method of therapy. Partial or com-

plate excision may be performed depending upon the local findings in each instance. Total patellectomy is particularly indicated in severely comminuted fractures. Compound comminuted fractures due to gunshot wound may be so badly shattered that nothing but total excision should be considered. Usually the degree of comminution noted at operation is much greater than the roentgenograms indicate. These cases are more commonly seen in the service. In civilian life simple transverse fractures of the patella comprise the large majority of cases. Total patellectomy may even be preferable here originally when one considers the possibility of developing nonunion or fibrous union, union with secondary arthritic changes, union with restricted mobility and refracture. In some cases the fragments unite with lengthening of the patella which may restrict joint motion. Excision of the patella is being employed in cases of arthritis involving the patella whether there has been a fracture or not.

Advantages of patellectomy. There are many advantages in the treatment of fractured patellae by excision. Patellectomy offers a rapid progressive uneventful recovery in practically all instances. This fact holds true even in the compound cases provided strict adherence to the principles of therapy in such instances is followed. The wound should be thoroughly debrided and cleansed. Following excision of the patella the joint capsule should be loosely closed with interrupted sutures. The remaining wound is left open for secondary closure after clinical evidence indicates that there is no infection. With the use of sulfonamides or penicillin locally and parenterally the incidence of infection can be held to a minimum. This statement is particularly true when the patella has been excised and has thereby been removed as a source of infection. Even in the occasional case of infection complicating compound fractures of the patella the prognosis for a well functioning mobile knee is better when patellectomy has been performed than when the patella has been permitted to remain.

The operative convalescence following patellectomy is much shorter than after open reduction. Patients treated by closed or open

reduction require plaster of Paris immobilization for approximately 4 to 6 weeks. The period of fixation will vary with the degree of injury and in open cases with the suture material used for repair. Following this an indefinite but usually long period of physical therapy and reconditioning is required to obtain free motion of the knee and strong quadriceps power. It may be 4 to 6 months before the patients return to strenuous activity. Even then the knee may be symptomatic and refracture may occur. Conversely in the healing of repaired fractures excessive regenerative changes may take place. Calcium is laid down giving the appearance of an abnormally large patella. In either case there is usually some loss of joint motion. Generally the patella is considered to have little osteogenic property.

Following patellectomy however the patient may be walking without dressings or support at the end of 2 to 3 weeks. Motion and quadriceps exercises can be instituted shortly after operation and a normally mobile and stable knee with complete function can be obtained within 6 to 8 weeks. Rehabilitation is progressive and rapid. In 2 of the cases to be reported in which the patella was fractured by gunshot wound the missile also damaged the articular surface of one of the femoral condyles. Yet there was no restriction of motion and no disability. One of these patients a paratrooper returned to jump duty. Patellectomy does not adversely affect motion, strength or stability of the knee. In soldiers with unilateral patellar fractures and complicated femoral or tibial fractures of the opposite extremity excision of the patella permits them early ambulation with weight bearing on the patellectomized extremity.

Partial excision of the patella may be indicated in cases of comminution at either pole of the bone. The small fragments are removed and the patellar or quadriceps tendon is sutured to and through the remaining large fragment. Normally it is the lower pole of the patella that is comminuted and excised. This circumstance leaves a large portion of the patella proximally to protect the femoral condyles when kneeling. In these cases union of the tendinous structure alone is involved and

the required time of immobilization is again shorter than when reduction is attempted. Approximately 3 to 4 weeks is adequate.

Disadvantages of patellectomy and regeneration of the patella. Resection of the patella is said to have several disadvantages. One is that it removes the normal protection for the femoral condyles. Dobbie and Ryerson however quote R. Brooke of England as stating that the patella is merely a morphological remnant phylogenically inherited and that it is tending to undergo reduction in size and to disappear. Brooke claims that it plays no functional part and that in its absence the efficiency of the knee joint is increased both in rapidity of movement and power. Nevertheless following patellectomy the articular cartilage over the femoral condyles and intercondylar space anteriorly is left exposed to direct trauma. Occasionally there may be pain when kneeling. Regeneration of a new patella in kind however generally affords adequate protection.

Dobbie and Ryerson quote Carey Zeit and McGrath in their published findings relating to the regeneration of the patella in dogs. Regeneration is said to occur under adequate mechanical conditions. The requisites are a normally mobile joint following patellectomy and adequate repair of the soft parts. Evidence of regeneration experimentally in dogs is said to appear roentgenographically in from 17 to 60 days. When adequate conditions do not prevail and the knee is not mobile due to joint fixation regeneration fails to take place. In other words the actual existence of a patella is based upon the functional need of a sesamoid bone at the site of pressure and tension where the quadriceps tendon glides over the femoral condyles in a freely movable joint. This observation appears to be substantiated by the cartilaginous and bone atrophy of the patella in cases in which the mobility of the knee is lost either by fusion or arthrodesis. There is no record however of total and complete regeneration of a new patella. In many cases actually there is no roentgenographic evidence of even partial regeneration of a new patella. Yet clinically one can palpate a firm round or oval movable body within the quadriceps tendon at the site of the old patella. The

body may consist of cartilage or fibrocartilage and therefore remain radiolucent. However it appears to function as well as a normal patella and afford adequate protection to the femoral condylar cartilage.

A second objection to the patellectomy is said to be the cosmetic change in the knee. It is true that the prominence of the normal patella is lost and even in case of patellar regeneration there is failure completely to recover the normal topography of the knee. However this objection is in no way compared with the benefits derived from excision of the bone in properly selected cases.

A third objection to patellectomy is said to be the diminution of pulley action which the patella normally produces during active extension of the knee. The patella does carry the quadriceps tendon away from the femoral condyles and theoretically should increase the efficiency of the muscle by its lever action. However one cannot disregard the excellently functioning powerful knees that are seen clinically following excision of the patella. The uniformly good results following patellectomy fully justify the theoretically mathematical diminution of leverage action of the quadriceps. This statement is especially true when one considers the possible untoward sequelae that may result in attempting to obtain bony union of the patella. Besides regeneration of the patella tending to minimize and restore the theoretical loss of the lever action.

Anatomy. In order fully to appreciate the operative technique consideration of the local anatomy may be in order. The quadriceps femoris the great extensor of the leg is subdivided into four portions the rectus femoris the vastus lateralis the vastus medialis and the vastus intermedius. All subdivisions converge at the distal end of the thigh anteriorly to form the quadriceps tendon which passes over the anterior surface of the patella and continues as the patellar tendon. The quadriceps tendon attaches to the base anterior surface and lateral borders of the patella. The patellar tendon inserts into the tibial tuberosity. In addition the quadriceps tendon gives off an expansion on either side of the patella to form the medial and lateral patellar

retinacula. These blend with the articular capsule and insert into the proximal end of the tibia on either side of the tuberosity. In fractures of the patella these expansions may be widely lacerated and it is important that they be thoroughly repaired. Thus it is seen that the patella may be regarded as a sesamoid bone developed within the tendon of the quadriceps.

Optimum time of operation. The interval between injury and operation varies with the general condition of the patient. In compound fracture thorough debridement and patellectomy should be performed as soon as it is safely possible. The earlier the wound is cleansed the less tendency is there for it to become infected. In simple fractures also there appears to be no advantage in operative delay. If there is no significant contraindication to immediate operation it should be performed directly after admission to the hospital. Hemorrhage can thereby be controlled thus avoiding unnecessary edema and infiltration of the soft tissues. Some surgeons feel however that when the soft tissues are moderately traumatized immediate operation will further damage them and jeopardize primary healing. They therefore prefer to wait about a week before operating. The decision primarily is a personal one but generally postponing operative delay offers no advantage.

TECHNIQUE OF OPERATION

In compound gunshot wound fractures whether penetrating or perforating the wound should be adequately exposed in order to permit thorough debridement. The author has had occasion to treat perforating gunshot wound with compound fractures when the roentgenograms were negative for foreign bodies. The wound entrance and exit were small yet exposure of them revealed the late hemorrhagic coloration of muscle indicative of necrosis. In such case it is imperative that the hemorrhagic area be excised since it may act as an excellent medium for the growth of anaerobic organisms. Following patellectomy the joint capsule is closed by loosely packing with iodoform gauze. Secondary closure can be



Fig. Case 1. Fracture of patella. Excision of patella. Closure of wound. Postoperative result.

performed in approximately a week provided there is no evidence of infection.

In simple fractures either a vertical or transverse incision is employed centered over the patella. The former requires wide dissection laterally of skin fascial flaps in order to expose the quadriceps expansions. The latter approach permits an easier exposure of the patellar retinacula. It is also preferable since it can be made within the skin crease and therefore will heal with less tendency to thickening which may prevent free flexion of the knee. Blood clot is removed and the patellar fragments excised can be taken to retain intact the quadriceps tendon anterior to the patellar fragments. The frayed edges of the extensor tendon and its expansions are then debrided and repaired. Interrupted sutures are employed beginning at both ends of the rent in the expansions and working centrally to tendon. This procedure makes closure much easier. Remaining wound is closed in layers.

Postoperative care. It is preferable to immobilize the knee with a posterior plaster cast for 10 days. However a firm flannel or stockinette bandage may also be employed. The important factor is that acute flexion of the knee be avoided until the repaired tendon is well healed. The healing requires approximately 3 weeks. Postoperative immobilization is not objectionable in cases of patellectomy. One



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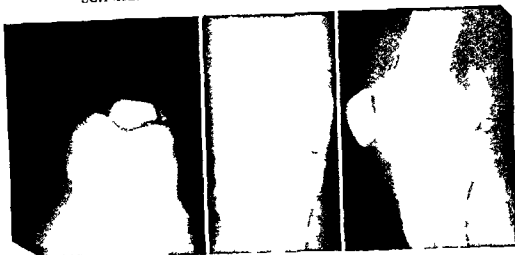
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of our patients remained in a plaster of Paris
 cast for 7 weeks during his evacuation to the
 zone of interior. Yet he has a strong well
 functioning knee with a full range of motion.
 When the splint is removed at the end of the
 first week, the patient may be encouraged to

begin flexing the knee gently. After the third
 week complete flexion should be strived for.
 Quadriceps setting exercises are allowed immediately
 upon removal of the splint.

Weight bearing with the aid of a cane and
 posterior knee splint may be permitted at the



1



1

Fig 3 Case 6 b. Longitudinal view of the knee joint before surgery. The patient is in a flexed position. The patella is visible in the center of the joint.

Fig 4 Case 6 b. Longitudinal view of the knee joint after surgery. The patient is in a flexed position. The patella is visible in the center of the joint.

end of 1 week. However full weight bearing without support should be delayed until the third week. By the end of 6 to 8 weeks the patient should be able to walk normally for a full day on level ground as well as up and down stairs. One of our patients returned to parachutist status at the end of 3 months. Complete rehabilitation is generally obtained at the end of 10 to 12 weeks.

END RESULTS

In cases of total excision of the patella the final result is generally excellent. The pa-

tient obtains a normally functioning knee with complete range of motion, normal stability, and powerful extension. They are able to walk long distances and can manage stairs without difficulty. They are able to squat fully on both legs and arise with ease. They can even squat partially on the involved extremity alone and arise to the erect position without undue effort. One patient could squat completely and arise on the involved extremity alone. Kneeling may cause discomfort temporarily but usually this subsides in time. One of the cases to be reported developed an

me is again became w dely separated. This s parat on occurred 3 months after the orig nal injury. The following day the patellar fragments ere compl tely excised and the tendons approximated and sutured. There was no evidence of callus at operation.

At pres nt the patient has a strong well function g right knee. He is abl to balance and squat partially on the right lo er extremity alone and then resume th erect positio. He is able to squat completely on both lower extremities without difficulty. Mot on f the knee is complete and stability is n rm l. He is able to h p on the right foot without buckl ng of the knee. Keeling n a hard surface causes mild d scomfort.

CASE 4. Sold r was injured by shrapnel on May 16 1944 at Anzi Italy sustaining a compo n l comminuted fractu e f the left patella. At opera ti on May 17 the patella was found to be comminuted more than th ro ntgenograms had dicated. It was th r for e cised. A la ge piece of shrapnel was f und in th infrapatella fat pad i the a ter r comp rtment of the kn e joint. It had gouged ut an area 1 5 c e timet rs i d amet r f om th lateral f moral co dyle. The foreign body was removed and the edges of th a ticular defect smoothed. The joint was irrigated and 0000 units of penicillin inst l d th it. The syno a was closed with t nte rupted sutures and the remain r of the wo nd gently packed with asel n gauze. Th leg was immobilized in pl ster. The patient was g n 25000 units f p e cillin i tr m sc la ly e ery 3 h urs fo a total of 825 000 units i 100 h u.

On May 27 a s co dary cl sur f the wo nd was perf rm l. The quadriceps and j tellar t ndons were coapt d and s t red a d the jo t capsul e d sed. Th r m der f the wo nd was cl sed in layers. Plaster of P r i immobilizati n s employed. This plaster r m ed o th ough ut the p ti s evacu t nt the e of int r r. It was rem el n July 14 7 we k aft r applicati. At that time knee motion was possible only from 80 to 160 d g. At pres th rang of m ti n i f m 180 to 40 d g es w th q dnceps power f 4 plus. Stability of the kn e s good a j at nt is abl t alk q t v l l. O p lpat on nega s the mp s that th r s reg erati f a small p tlla. H v r th gen rat n is not s ble n the x rays flms lat t c n balance h m lf w ll on th n vol ed l g sq t partially and r ume th r ct post w th o t d n difficulty. With e ght d str buted n both f et he ca q a lalm t c m pl tely. He s be g r d u n d r ret m t duty.

CASE 5. I rat ope was admitted to Station 11 sp t l Camp Mackall N rth Carolina on Dec 6 1943 with p forati g 45 caliber bull t we nd thro h th r ht knee. He sust d a comminuted fra t e f th proximal th rd of the patella. Roentgenograms f th k e als re ale d a defect in th a ticular urf ce f the l t ral femoral e

Th entra ce and exit wounds were enlarged and debrided. In addition to the comminution of th patella noted in the roentgenograms there was also noted at operation a complete longitudinal fracture. The patella was excised *in toto* and the defect in the femoral condyle smoothed. The joint was flushed with sodium sulfathiazole solution. Plaster of Paris immobilizati n was employed for 1 week. About 3 week later the patient began to walk. He was last seen by me on February 29 1944 at wh ch time he was back on full jump status. He had a complete range of painless motion in the knee and his quadriceps power was excellent. Stability of the knee was normal. Patient was able to balance and squat completely on the i vol ed leg alone and return to the erect posit on without d i ficulty. He was able to walk sta rs with ease. His knee was functi n lly as normal as before h s injury.

CASE 6. Soldier fell off a horse on December 15 1943 while in New Zealand and sustained a long t u d nal fracture of the late al portio of the right patella. He was treated with bed rest and plaster of Paris immobilization fo 2 weeks. He was then permitted up with crutches and gradually walked ith ut support. He return d to duty but th pain i the knee inc ead. Check up roentgenograms taken on April 15 1944 revealed nonunio n of the fractu e. Accordingly n April 25 patellectomy as performed. On May 4 1944 he began to run an elevated temperature and on May 23 the knee was i cuse l and seropurulent material obt incd. On July 19 the knee was manipulated. When exam n d by me on September 26 he p esented a fairly good kn e. He walked with out a limp and stability of the knee was normal. He could balance and quat p rtially on the involved leg al ne return ng to the erect posit n. Th re was some restriction of motion which was possible from 18 to 115 d gr es. Quadriceps power rated a 4 plus. On p lpat n one g ned th impression that an indefinitely outl ned reg n er ted patella as pre nt. Roentgenograms s b stanti ted the progres e deposit n f calcium within the q ad cep and patella tendon.

Knee joint infections without patellectomy usually result in a much more disabling and stiffer joint than this patient has. The patella usually becomes fixed to the femur and causes marked restriction of motion. Excision of the patella in this case has permitted a more freely movable and useful joint despite the complicating infection.

CONCLUSIONS

1 The treatment of fractured patellae in the past by so many methods is indicative of dissatisfaction with all of them.

2 When one considers the possibility of fibrous union or nonunion union with restricted

mobility and instability and union with secondary arthritic changes one notes the shortcomings of open as well as closed reduction of the patella

3 The high incidence of refracture of the patella even following open reduction reveals the need for a more effective method of treatment

4 Excision of the patella either partial or complete is the method of choice in fractures

5 Partial excision with removal of the small comminuted fragments alone is indicated only when a large uninvolved portion of the patella can be left *in situ*

6 In all other instances of fracture total excision is preferable for the following reasons
(a) Rapid progressive uneventful recovery usu-

ally ensues (b) postoperative immobilization and convalescence are shortened (c) a more stable and freely movable knee joint is generally obtained (d) even when complicating infections occur the prognosis is better when patellectomy has been performed (e) excision of the patella does not impair the efficiency of the knee

7 Regeneration in kind may occur following excision of the patella to protect the exposed femoral condyles

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INACTIVATION OF PENICILLIN BY VARIOUS GRAM NEGATIVE BACTERIA

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ALTHOUGH the majority of infections seen by the surgeon are caused by the staphylococcus and the streptococcus many are mixed infections produced by these and various other bacteria particularly the gram negative bacilli. In the treatment of established infections of surface wound and abscesses pure staphylococcal or streptococcal infections have responded much more rapidly and completely to general or topical penicillin therapy than did mixed infections. The course of many of the mixed infections seemed to be completely unaffected by penicillin and even the staphylococci and streptococci remained present in large numbers in the exudates. This fact suggested that the penicillin was being inactivated or destroyed in the infected area probably by the action of the various gram negative bacteria. To explain these differences of response to penicillin therapy a study was undertaken to measure (1) the effect of penicillin on the growth of the gram negative bacilli frequently found in infected wounds and (2) the effect of various gram negative bacilli on the activity of penicillin.

It is well known that penicillin is a labile substance which is destroyed by heat prolonged exposure to the air and oxidizing or reducing agents. In addition Abraham and Chain have found that extracts of *Escherichia coli* prepared by crushing a suspension of the organisms in a bacterial crushing mill destroyed the bacteriostatic property of penicillin. They believed the active substance in these extracts to be an enzyme because it was not dialyzable through a cellophane membrane and because it was inactivated by heating at 90 degrees C for 5 minutes or incubation with papain.

METHODS

The gram negative bacteria commonly found in infected wounds burns or deeper abscesses are *Escherichia coli*, *Bacillus pyocyaneus*, *Aerobacter aerogenes*, *Bacillus proteus* and *Bacillus alkaligenes fecalis*. Representative strains of each of these bacteria were obtained from infected wounds and cultures of each in broth were used throughout the experiments.

In the first group of experiments six series of culture tubes of broth media containing various concentrations of sodium penicillin from 0.005 to 5000 units per cubic centimeter were prepared. Five of the series were then inoculated with 0.1 cubic centimeter of an 18 hour culture of one of the various gram negative bacteria and the sixth with 0.1 cubic centimeter of an 18 hour culture of a susceptible strain of hemolytic *Staphylococcus aureus* which was used as a control. After 4 8 12 16 and 20 hour periods of incubation the effect of penicillin on the rate and amount of growth was determined with the aid of a turbidimeter.

In the second group of experiments the effect of the various gram negative bacilli on penicillin was studied *in vitro*. Tubes of broth media containing 20 units of penicillin per cubic centimeter were inoculated with 0.1 cubic centimeter of an 18 hour culture of one of the gram negative bacilli and incubated at 4 8 12 16 and 20 hours respectively. Another tube containing an equal number of units of penicillin per cubic centimeter was used as a control and incubated for 20 hours without bacterial inoculation. After the various periods of incubation the cultures were passed through a Berkefeld filter to remove the bacilli. The antibacterial activity of the bacterial free filtrates was then measured for the hemolytic *Staphylococcus aureus* by determining the greatest dilution at which growth was inhibited.

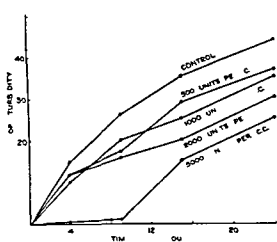


Fig 3 Inhibitory effect of high concentrations of penicillin

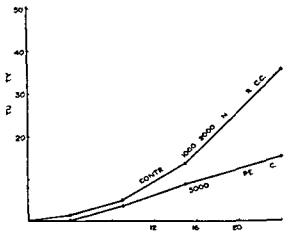


Fig 4 Effect of concentration of penicillin on growth of Bacillus pyocyaneus

On the other hand many of the strains of *Bacillus pyocyaneus* tested showed marked resistance to concentrations of penicillin as high as 5000 units per cubic centimeter (Fig 4)

The effect of gram negative bacilli on penicillin After tubes of broth media containing 20 units of penicillin per cubic centimeter were inoculated with *Escherichia coli* incubated for 4 8 16 and 20 hours and then passed through a Berkefeld filter to remove the bacilli the antibacterial activity of the filtrate for the

hemolytic *Staphylococcus aureus* was measured by determining the greatest dilution at which bacterial growth was inhibited. It was found that the penicillin activity had been progressively destroyed after 4 8 and 12 hours growth of the colon bacilli. The destruction was practically complete at 12 hours. The control retained its marked antibacterial action for the hemolytic *Staphylococcus aureus* after 20 hours incubation and filtration.

The same experiment was repeated with *Bacillus pyocyaneus* and a similar progressive

TABLE II — SHOWING THE DESTRUCTIVE ACTION OF CULTURES OF *ESCHERICHIA COLI* ON PENICILLIN

Dilution of bacterial filtrate						Control
Dilution of filtrate	8	16	20	24	28	
1	—	—	+	++++	++++	—
2	—	—	+	++++	++++	—
3	—	—	++	++++	++++	—
4	—	—	++	++++	++++	—
5	—	+	+++	++++	++++	—
6	—	++	++++	++++	++++	—
7	+	+++	++++	++++	++++	—
8	+++	++++	++++	++++	++++	—
9	++++	++++	++++	++++	++++	—
10	++++	++++	++++	++++	++++	++
11	++++	++++	++++	++++	++++	++++

Bacterial filtrate free of bacteria after incubation with *Escherichia coli*

TABLE III — SHOWING DESTRUCTIVE ACTION OF CULTURES OF *BACILLUS PYOCYANEUS* ON PENICILLIN

Dilution of filtrate with <i>Bacillus pyocyaneus</i>					Control
Dilution of filtrate	8	16	20	24	
1	—	—	—	++	—
2	—	—	+	++	—
3	—	—	++	+++	—
4	—	+	+++	+++	—
5	+	++	+++	+++	—
6	++	+++	++++	++++	—
7	++	+++	++++	++++	—
8	+++	+++	++++	++++	—
9	+++	+++	++++	++++	—
10	+++	+++	++++	++++	++
11	+++	+++	++++	++++	+++

Bacterial filtrate free of bacteria containing penicillin after incubation with *Bacillus pyocyaneus*

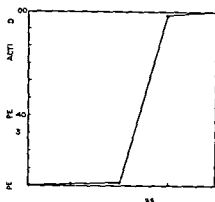


Fig 5 P tag d t f penicillin na ti ti by
t ly gr g e lt es f B cill pyocy

destruction of penicillin was noted (Table III)

When the percentage and rate of penicillin inactivation were charted it was noted that approximately 98 per cent of the penicillin was destroyed within 12 hours and almost all of this during the 8 to 12 hour period by *Escherichia coli* and *Bacillus pyocyaneus* (Fig 5)

Aerobacter aerogenes produced a similar but lesser degree of penicillin inhibition (Table IV)

On the other hand *Bacillus proteus* had but little destructive effect on the activity of penicillin (Table V)

TABLE IV.—SHOWING EFFECT OF CULTURES OF *AEROBACTER AEROGENES* ON PENICILLIN

Dilutions	Amount	8	16	24	Control
1	—	—	—	—	—
2	—	—	—	—	—
3	—	—	+	++	—
4	—	+	++	++	—
5	++	++	++	++++	—
6	++	+++	++++	++++	—
7	+++	++++	++++	++++	—
8	++++	++++	++++	++++	—
9	++++	++++	++++	++++	++
10	++++	++++	++++	++++	++++

Bacterial free filtrates containing penicillin after incubation with *Aerobacter aerogenes*

When a 24 hour culture of *Escherichia coli* grown in the absence of penicillin was passed through a filter the bacterial free filtrate did not contain a substance which inactivated penicillin. At the end of 4 and 16 hours incubation with penicillin no significant loss of antibacterial activity for the hemolytic *Staphylococcus aureus* was noted. Likewise no significant destruction of penicillin was produced by the action of heat killed cultures of *Escherichia coli*.

ANALYSIS OF STUDY

Escherichia coli, *Bacillus pyocyaneus*, *Aerobacter aerogenes* and *Bacillus proteus* are frequently found in infected wounds and burns in association with staphylococci and other bacteria. They are completely resistant to the action of 20 units of penicillin per cubic centimeter, a concentration greater than any produced in the blood and tissues by parenteral administration. High concentrations of 50, 100, 250, 500, 1000, 2000, and 5000 units have a definite but incomplete inhibitory effect on the rate and amount of growth of many of these bacteria, although the effect varies in degree with different strains of the same organism. The action is bacteriostatic since the inhibited bacilli grow profusely on subcultivation in penicillin free media. Five strains of *Bacillus alkaligenes fecalis* on the other hand were very sensitive to the action of penicillin.

TABLE V.—SHOWING EFFECT OF CULTURES OF *BACILLUS PROTEUS* ON PENICILLIN

Dilutions	Amount	8	16	24	Control
1	—	—	—	—	—
2	—	—	—	—	—
3	—	—	—	—	—
4	—	—	—	—	—
5	—	—	—	—	—
6	—	—	—	—	—
7	+	++	++	++	—
8	+	+++	+++	+++	—
9	+++	+++	+++	+++	++
10	++++	++++	++++	++++	+++

Bacterial free filtrates containing penicillin after incubation with *Bacillus proteus*

These studies explain at least in part the frequent failure of penicillin therapy in mixed infections of wounds

To overcome the destructive effect on penicillin produced by the gram negative bacteria these experiments suggest several principles in the local therapy of infected wounds

- 1 The removal of as many bacteria from the wounds as possible immediately preceding the topical application of penicillin The mechanical removal of devitalized tissue and purulent exudate by incision and drainage aspirations or irrigation greatly reduces the number of gram negative bacteria at the time of the topical application of penicillin Devitalized tissue invites and harbors gram negative bacillary infection and its removal by mechanical or chemical means would seem to be particularly important

- 2 The local application of higher concentrations of penicillin up to 1000 or 2000 units per cubic centimeter to inhibit as much as possible the growth of the gram negative bacilli and their destructive action

- 3 Application of penicillin at frequent intervals of 8 hours or less to compensate for the amount destroyed by the gram negative bacilli and to insure a level therapeutically effective for the penicillin sensitive bacteria also infecting the wound

CONCLUSIONS

- 1 Various gram negative bacilli commonly found in infected wounds were very resistant to the action of penicillin in concentrations up to 20 units per cubic centimeter Higher concentrations up to 2000 to 5000 units per cubic centimeter produced a definite inhibitory effect on their rate and amount of growth This effect was bacteriostatic in nature

- 2 *Bacillus alkaligenes fecalis* however was found to be very sensitive to penicillin

- 3 The activity of penicillin was progressively destroyed by the growth of these bacteria particularly the *Escherichia coli* and *Bacillus pyocyaneus* in 4 8 and 12 hours The rate of destruction was greatest during the 8 to 12 hour period

- 4 The degree of inactivation not only varied with the different types of bacteria but also with different strains of the same type

- 5 The mechanical removal of devitalized tissue and purulent exudate followed by the topical application of higher concentrations of penicillin up to 1000 or 2000 units per cubic centimeter at frequent intervals of 8 hours or less is suggested in the local therapy of infected wounds to minimize the gram negative bacterial inactivation of penicillin

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The patient was given plasma and blood transfusions immediately and taken to the operating room. Open peritoneal adhesions were admixtured and the abdominal wall was infiltrated with 3½ per cent novocain solution in the right transverse plane just above the level of the umbilicus. The abdomen was opened through a transverse incision. The ether anesthesia was maintained at this time and the remainder of the procedure was performed under local anesthesia. The apex of the intussusception had progressed from the terminal ileum to the splenic flexure of the colon. The distal portion of the intussusception reduced with ease and continued uninterrupted until the ileocecal valve was reached. The final stages of reduction were difficult but was finally accomplished with undue trauma to the bowel. The terminal ileum, cecum and terminal portion of the ascending colon were engorged. The omentum of the ileocecal colon was observed. The terminal 3 inches of the ileum, the cecum and proximal 1 inch of the ascending colon were removed and an open side-to-side anastomosis was done between the ileum and ascending colon. The incision was closed in layers without interruption of the silk. Postoperatively the patient was placed on an oxygen tent and given parenteral fluids including blood plasma glucose and line C nutrition. Gastric suction was maintained for 4 days. The ileocecal pouch was relatively smooth until the tenth postoperative day when the temperature became elevated to 102 degrees Fahrenheit. Examination revealed moderate injection of the pharynx and injection of the tympanic membrane bilaterally. The fever continued at this level for 5 days and then subsided with antipyretics. Normal bowel activity returned 3 days and 3 days after the peritoneal and oral feedings were resumed on the fifth day. The patient was discharged March 22, 1944, in a satisfactory condition since that time.

The factors militating against the accomplishment of primary resection have seemed so numerous and so uncompromising that the procedure has been condemned by many surgeons who because of their peculiar experience are qualified to speak authoritatively on the subject. Unfortunately the alternatives to resection with immediate restoration of continuity of the bowel in the presence of irreducibility and gangrene are associated with an equally forbidding mortality and are anatomically and physiologically less plausible.

FACTORS INFLUENCING RECOVERY

Significant factors which influence the course of intestinal resections in infants may be divided conveniently into 3 phases.

Preoperative phase. In the preoperative period the early recognition of the intussuscep-

tion is of paramount importance. The classical description of the disease is usually reproduced with such fidelity that the diagnosis is rarely difficult. Delay on the part of the parents in bringing the infant to the physician accounts for the majority of late diagnoses but occasionally the apparent benignancy of the condition and failure to feel the abdominal mass will lead the surgeon into grievous error.

Once the diagnosis has been established surgery should be delayed no longer than is required to render adequate preoperative preparation. This preparation should comprehend the treatment of shock which is often present in some degree and the restoration of fluid and electrolyte balance. Failure to observe this important aspect of preoperative therapy has in our opinion contributed in a real sense to the high mortality of intestinal resection in infants. The immediate administration of plasma until properly typed blood is available should be employed routinely and the infusion should be continued throughout the operation. This procedure if carried out with dispatch need not delay surgical intervention.

A nasal catheter should be passed in order to maintain the stomach in a state of decompression during and subsequent to the operation. There can be little doubt that infants tolerate intubation poorly but we believe that the advantages outweigh the disadvantages even in patients of this age.

Operative phase. The important considerations bearing on the operative phase of treatment are numerous.

The anesthetic of choice is open drop ether but the related factors of depth, duration and supplemental agents deserve particular attention. Infants already suffering from shock submitting to a major surgical procedure which involves considerable manipulation of the abdominal viscera tolerate deep and prolonged anesthetic very poorly. Consequently it has been our practice to administer light ether anesthesia followed by liberal infiltration of the abdominal wall in the region of the proposed incision with a 1½ per cent solution of novocain. The abdomen is opened and the portion of the intussusception which can be reduced easily is manipulated intra abdominally.

The diffuse form Chronic ulceration causes extensive thickening and fibrosis of all layers of the bowel. Multiple areas are affected with a predilection for the cecum and sigmoid colon and alternate with segments of attenuated intestinal wall. Occasionally the whole length of the large intestine is thickened.

The localized form is discussed under amebic granuloma.

The solitary chronic ulcer most often occurs in the rectum. The size varies and may extend to several square inches. Euberant vascular granulation tissue is found in the base and the margins are thickened and edematous—appearances which may readily be mistaken for malignancy. The mucous membrane in the vicinity may be very edematous in the form of pseudo polyps. Chronic amebic ulcers may very occasionally become malignant (27).

The fibrous stricture Rogers considers that fibrous stricture rarely follows amebic infection (35) but this is not the experience of other observers (12, 24, 30). According to Lynch, When cicatricial deformity of the colon and extensive peritoneal fibrosis have resulted from prolonged or deep or extensive infection, the damage is more or less permanent even if the ameba is eradicated. Stricture is probably the result of associated secondary infection for the *Endamoeba histolytica* induce little inflammatory reaction of itself (12). It is often surprising to see at sigmoidoscopy how even advanced amebic ulcers of longstanding resolve with little or no scarring. Applying the modern criteria for diagnosis including biopsy, amebiasis is a rare cause of rectal stricture. It may be noted here that the identification of the *Endamoeba histolytica* in the tissues requires special experience and in this type of lesion may present difficulty even to the expert.

Amebic granuloma or ameboma Prolonged infection under certain conditions as may occur in the delayed resolution of an acute infection gives rise to an inflammatory thickening which gradually becomes defined to form a discrete mass—in the case of amebic infection this is known as amebic granuloma or ameboma. The cecum is most often affected but ameboma may occur in the sigmoid and other parts of the colon. The omentum is

usually adherent and the appendix may be included in the mass which may also involve the ascending colon and attain a considerable size. To the naked eye the condition may suggest the results of acute appendicitis, diverticulitis or regional ileitis. Chronic amebic ulceration occasionally produces an analogous condition in which fibrosis predominates. When a localized segment is affected carcinoma, hypertrophic tuberculosis or diverticulitis may be closely simulated (15, 18).

Amebiasis of the appendix Amebic infection of the appendix arises by extension of the infection from the cecum and whenever the cecum is extensively affected the appendix is likely also to be involved. Most examples are subacute rather than acute. The incidence has been determined at postmortem examination of patients who died from amebic dysentery. In Clark's series of 186 postmortem examinations the appendix was involved in 41 per cent and 9.2 per cent abscess or perforation had occurred (8). His series is exceptional for only a small proportion of the patients had received emetine. Craik found 16 examples in 65 necropsies and Stron reported 7 in a series of 102.

➡ The pathological changes range from pinpoint ulcers confined to the mucosa and submucosa to inflammatory reaction which includes the whole organ. In the more severe infections edema is a prominent feature, the walls are thickened, pus is found in the lumen and the serosa is congested and may be covered with fibrin. Similar changes are usually found in the cecum. Abscess and perforation have been cited but clinical experience indicates that these complications are rare if emetine is employed. Examination of the contents of the lumen usually discloses the *Endamoeba histolytica*. Apart from the presence of the ameba, neither macroscopic nor microscopic appearances can be distinguished from those of nonamebic appendicitis. Remarkably few examples are reported in the literature of the discovery of the *Endamoeba histolytica* in the tissues of appendices removed at operation even though they have been present in the lumen (14, 18, 24) but they are often seen in postmortem specimens with coincident amebiasis of the cecum.

The majority of appendicular lesions which develop during an attack of acute cecal amebiasis are of this type but of course nonamebic acute appendicitis may also occur.

Following an attack of acute cecal amebiasis interval appendicectomy occasionally reveals gross changes in the form of constrictions and adhesions and the appendix may contain pus with amebae. Evidence of chronic inflammation is often seen on microscopic examination but how far the appearances can be attributed to the previous amebic infection is conjectural.

Local complications of intestinal amebiasis Perforation is frequently found at postmortem examination in fatal cases of intestinal amebiasis. Strong reports 10 per cent, and Clark 10.7 per cent (8, 39). The commonest sites are the cecum, sigmoid appendix and rectum. Multiple perforations may take place. As in other diseases the lesion may be acute, subacute or chronic and either intraperitoneal or extraperitoneal. Most perforations appear in association with fulminating attacks but the condition may arise in attacks of acute and chronic dysentery of any severity. In the retroperitoneal variety, abscesses may form and track widely into the peritoneal, subphrenic, and pelvic spaces (10, 24).

Brief mention only will be made of other local complications. Spontaneous hemorrhage of serious proportions is occasionally seen—3 of our patients required transfusion on this account. Handling of the bowel at operation may be followed by dangerous hemorrhage from amebic ulcers; the cecum is particularly prone to this complication (3).

Intussusception is rare and no instance occurred in our series although examples were seen in Indian hospitals during the same period. Spontaneous reduction may occur as in a case reported by Parry. Adhesions, bands and linking of the bowel are common sequelae and an occasional cause of intestinal obstruction (1).

CLINICAL ASPECTS AND DIAGNOSIS

The clinical manifestations are just as varied as the pathological. Atypical forms are common and may so closely simulate almost any gastrointestinal disease, acute or

chronic that it is important to give every consideration to amebiasis in the differential diagnosis when dealing with patients who have lived in endemic areas. In spite of modern treatment relapse is frequent sometimes after a long interval of apparent good health and permanent cure should not be assumed.

The clinical diagnosis must be supported by the recognition of the *Endamoeba histolytica* in the stools or in specimens from the walls of sinuses or obtained at sigmoidoscopy or in biopsy material. In assessing the significance of the presence of the vegetative form of the *Endamoeba histolytica* the fact that amebiasis may coexist with other conditions should not be overlooked. *Endamoeba histolytica* cysts so often occur in the stools of individuals in whom there is no demonstrable sign of disease that of themselves they are of little diagnostic value.

A further check on the diagnosis is provided by observing the effects of treatment with emetine. If complete resolution is not obtained the diagnosis must be considered further to exclude a coexisting lesion. Very occasionally intestinal amebiasis is resistant to this drug—most often in examples of long standing infection or when emetine has been previously employed. The drug should be used with caution on account of its cumulative effect and the danger of toxic action on the myocardium and nervous system (31, 40). Used with due care its value as a control of diagnosis is very considerable.

In chronic attacks investigation of the stools is an important step in the diagnosis but in acute attacks when an urgent decision must be made this would involve too much delay—one or two negative stools are of no significance. Acute surgical conditions must be excluded and in the remainder a provisional diagnosis is made on clinical grounds and subjected in due course to laboratory confirmation. Unless this is obtained before emetine is given the chance of discovering the ameba will probably be lost but in unusually severe attacks immediate treatment takes precedence and the accuracy of the diagnosis is later made evident by the response to emetine.

Acute intestinal amebiasis perforation As previously noted the majority of perforations

occur during the course of an unusually severe attack of intestinal amebiasis occasionally a chronic ulcer perforates in a patient with few or no previous symptoms. It is unnecessary to refer in any detail to the clinical features as they do not differ from those due to other perforations. Severe toxemia from the associated intestinal amebiasis may almost completely mask the clinical evidence of perforation and it is not a very uncommon experience for an unsuspected perforation to come to light at postmortem examination. Arising from a subacute perforation an abscess may develop very insidiously and lead to difficulty in diagnosis especially when the history does not suggest intestinal amebiasis. perirenal collections for example may be mistaken for typhoid malaria empyema and hepatitis (32).

The incidence of clinical perforation is low. Strong reported 3 examples in 200 cases. In our series of 450 cases there was only one perforation which followed exploratory operation in a patient who died from a fulminating infection of the cecum and ascending colon (see Case M. H. following). In the following 100 cases perforations occurred 1 in the cecum in a patient moribund from a diffuse intestinal amebiasis and the second in a very severe acute infection of the sigmoid which proved fatal despite operation.

When perforation takes place in the course of fulminating attacks the bowel is usually so friable that repair is problematical. Multiple perforations may be found and the toxemia is often overwhelming the outlook even with surgical interference is very grave indeed. By contrast in chronic and relapsing amebiasis the condition of the bowel is much more favorable and if emetine is not delayed the prognosis approaches that of perforation due to causes (1, 11, 19).

Acute cecal amebiasis. Although there are certain individual features acute cecal amebiasis may be accepted as representative of the localized acute forms of intestinal amebiasis which may affect any part of the large intestine.

When the infection is confined to the cecum the consequences differ from those of the ordinary diffuse form amebic dysentery in many important respects. (a) pain is referred

to the umbilical region and not to the hypogastrium (b) the local signs and local pain are confined to the right iliac fossa (c) diarrhea blood and mucus are less frequent and not infrequently absent and (d) in general it is more difficult to find the ameba in the stools. This particular difficulty must be recognized or the diagnosis may be overlooked as occurred in some of the published cases (18, 23). Fortunately the response to emetine provides a convenient indication in suspected cases.

For the clinical discussion 3 types of case will be considered the fulminating the acute and the special variety the acute cecal ameboma. All have certain features in common which are presented in Table I.

Fulminating attacks are uncommon the majority are severe from the start but they may arise as an exacerbation of an ordinary mild intestinal amebiasis. The onset is rapid and abdominal pain both midabdominal and in the right lower quadrant vomiting pyrexia and tachycardia are the prominent features although subject to some variation. Diarrhea may appear either early or late and it is followed by the passage of blood and mucus. The signs of local peritonitis appear early and many patients fail to respond to medical treatment and succumb within a few days to the effects of gangrene or perforation.

A surgical opinion may be required in the less typical attacks. The onset is less abrupt the toxemia more prominent and the local signs remain more localized in the early stages than in the case of perforation but of course when perforation complicates this type of cecal amebiasis the diagnosis becomes formidable. Appendicitis can be excluded by the toxemia the wide extent of the local signs in the early stages and the departure from its typical mode of onset and course (Table I). If the diagnosis remains in doubt laparotomy becomes obligatory.

The following case is presented as a faulty typical example.

M. H. aged 9 years admitted 5/1/34
complaining of right iliac pain blood and mucus in stool griping epigastria for 4 days.
As his first attack history of previous attacks of dysentery 2 years ago.
He was treated with hydrate of aluminum which was given in the abdomen. The stools reveal an indurated

not xult w th blood but no amela or cysts and a cult re was made

At 24 hrs ere l continu pain app r in th right iliac a ithnause Di rheaa troublesome an h temper t re w s 100 deg es pulse rate 30 a l respiratory rat 22 per minut Th t ngue wa furr d an l mark d tende nes an l r g dity ere found n th painful area max mal at McBurney's po nt A lump was f und a d the pro s and thigh r tation tests and rect l exa minat on ere n gati To exclud pe f ration or appe dici tis exploration was ad ised

At pe tion local pe itonit s v th turbil free fluid a d an ed mato s and c ngested c cum were d slosed Th append x was in a imilar state and fibrin depos t was seen on both organs Perforatio and gangrene were excluded and the operat as concluded w th the r moval of the appendix v h ch was v ry s ollen th oughout and the cont nt we e mucopurulent but the e was no perf t on gangren o ulceration

The n t l y saw l ittle chang in his e nd t and he v as still passing f equent loose blood sta ed stool app rntly fr e from amebae Th culture f the early stool d d not e cal any path g n o ganism Lat r h s cond ti n became inc eas ngly s rious Alth ough the dia rheaa continued and the stools were f equentl e amined it w s n t til August 15 that the Endamo ba h tolytica was f und a d then in large numbers Em tine a g en to s pplem nt his ulf amid treatment b t w thout effect On August 18 his blood co t ho d red blood lls—35 mill s hemogl bin go per c t white blood cells 7000 Many deg ne at p l morphonuclear cells were present and some my loocytes a d nucleat d red c lls A blood transf s n wa g ven but the patient d ed o th n xt d y

Postmortem e aminat on disclos d plast c pe tonitis with widespre d ecent adhes ns f ee p was found i the r ght iliac fo a and in th ght parac l c gutt r extend g pwa d t ward the k d ney P was also se b hind th cec m Th append x st mp was o nd but a perforatio h d occurred in the poste ior su f c of th a veni g col Th cecu prese t lse eral p tches f gan ger a ith wh l f the la g testi w ft and f alle th sten ive ga gr n f th muc s mem n a lam bic lc at on Th cut i flam n at p y ocer t f d j a d so hes i t th ileum

This patient was admitted before our lab oratory was opened and hi tological exa minations were not made Commenting on the case in the light of subsequent experience of amebiasis the cecum was noted at operation to be much more affected than occurs in appendicitis and the possibility of amebiasis might have been confirmed by immediate examination of mears from the contents of the appendix The lat w of several days be

fore the endameba appeared in the stools is of interest—thi also occurred in several of the recorded cases We would now advise the empirical use of emetine immediately after operation in this type of case rather than await a po itive stool report Involvement of the ileum has been found in only about 5 per cent of fatal cases of intestinal amebiasis

The acute type of cecal amebiasis is much commoner than the type just described Constitutional disturbance is slight nausea and vomiting unusual diarrhea rarely prominent and abdominal pain is not excessive The local signs tend to be disproportionally well marked Complications are infrequent and a response to emetine is to be expected within 3 days Further details appear in Table I

Involvement of the appendix by extension from the cecum is probably of frequent occurrence as already noted in the remarks on pathology From the clinical point of view this extension is of little consequence because both cecal amebiasis and amebic appendicitis are essentially medical diseases clinically indistinguishable usually responsive to medical treatment and unsuitable for surgery unless complicated by abscess or perforation (12) Lxceptional attacks do not react to emetine as in the following example

A J aged 24 years was admitted n S pteml r 9 942 suffering from dys ntery which had com m need 6 weeks p v sly in th form of a mld d a he later replaced by ery freq ent stools with blood a d mucus This was h first attack Wh n exam ned he compla ned of interm ittent pains in both il c regions b t apart fr m tend ness ther no abnormality was f nd Th stools contain d E damoeb hst lytica nd emet e a d carb s ne were gi n Although the diarrh a was r lie ed and th ameba d appeared fr m the stool inte mittent p ns occur d no in the umbilical and r ght iliac r gions Th attacks took pl ce three or four t mes a day lasting l an hour or so at a t me The app tit w poor b t there was n n usea r vomiting

The t cks i cr d severity and w lln a kel tendernes d l ped in th ri ht iliac fossa and t a much less r deg e pers t d n the left s de o er the sgmoid a d descend g colon The e was n r g d ty and n ma s Rpeat d stool xaminat n wer n gative nd tw sgmo loecopies al o howed n b rmal ty On Oct be 31 he had an att ck of gr at r rty than befo e and perat wa d is d

Laparot my re calcd n d m t us inj ct d append x with ft th ck w ll a d the a l y cent

TABLE I.—CLINICAL FEATURES OF ACUTE CECAL AMEBIASIS AND DIAGNOSIS FROM ACUTE APPENDICITIS

Acut C cal Am biasis				Acut Appe dicitis			
<i>P e r o u h tory</i>				<i>O t</i>			
Of t p vi tta ks f dys t ry C mm nly p o d mal symtom — o at abd min l d m f t ague				Occas ily tta k of ? ppe d t p t poe t t dyse t ry Prev u hi t ry f dyse t ry does t e l d appe dicitis No prod m l ympt m			
ll h lth m l d d r rhea r up u							
<i>S d d n. P</i>				<i>lmo t l ys f rred prese ti g</i>			
M v be sudd n mm nlym egrad l l au ref rr d loc l u l p ese t g ymptom b t tta km y om m th d r r h a ept ally r t tacks w th mting d f e				S d d n. P lmo t l ys f rred prese ti g			
<i>P — R f d</i>				<i>Umbil l p g stnc. Colicky hi g Freqently</i>			
M d bd m nal but also hypog t if d t l c l l ed R ly U u lly h ky oc lly chi g Int rmittent w th pe od f p t l m pl t h p es t g sympt m				nd v tantl/r rurn g or e t o Typically			
h ef P se t u ymptom s bo t s per nt f t t ks M y ly appe l te mai b ent							
<i>P — Loc l</i>				<i>I nty fappe dix Appe rs m tume alt r e red</i>			
Pr t right lta fossa f m hest t f tta k or s ntr l ympt m T nd to be diff e f m th first Al curs rd t l l d h if m l ed U lly h of mode t t nsity				pa v ry occa lly th t l ympt m W l loc l ized t first te d glate M y be se			
<i>Y d m i g</i>				<i>O both ge rally oc u</i>			
B th bs t s mld t t ks but t b p ct d re t t cks							
<i>D arrh</i>				<i>O cca n lly d r r h s ly</i>			
Appe rs l y m th l s s th s p ce t f t tacks d m ybe t l ympt m M y pp s ft m d y Usu lly n t s Blood a d mucus l t a t Occas ily onstupati If d tal l lso ff ct d diarrh m h k ly				C ut pati yu pt m W th pel abscess blood d m m ybe pas d			
<i>E d m b h l t l y t a t l</i>				<i>P es n l E dam eb h t l y t d e t l d</i>			
V g tati E d m b h t l y tica lly b t a ally t f o d th pe ted am t f t l C mm nly nly f und ft som d ys				m b app d cit			
<i>C t t t al d t b</i>				<i>Mod t se f t m p t d pul e f m few h us</i>			
In m lde tta ks notably less m ked th th t ty floc l phys l nsw uld g t Sh h t n ft mpe t r and p l s f m nset l pti nally e t t cks				ft t f t t k. C stit u l ff ct k p pac th loc l phys al gns T gu gly f d Pyren nd t hyca d t f t f ly t ppe dicit bstru ti			
<i>T xder es and g d ty</i>				<i>T d rness ppears m tum alt r gn l p t</i>			
T d rness us ally mod rat m ybe te Typically diffus in right h f s a f m ry ly att k Also distal l d h if ol ed Rigidity typ ally diffuse nd oc m pl t d d or not mask th k ed ec m oc asu nally rigid ty ll m k d				t d g b t t lun of col Rigid ty l l ed t f t l t v i nd g ft p ed dp u g p h a os f bd minal t t			
<i>Palp bl mass</i>				<i>Appears lat d slowly s bs des f rm absces</i>			
Thickening f exum pp t ly d if esol tio d l yed grad lly be oming m ed fin d T d t first l solat M y pers t f ns d bl tum if u tu n s mutt d. Ab f rm tio un mm n.							
<i>Sp c al signs</i>				<i>Psoas gn thigh tatio gn d ectal tenderns</i>			
Psoas gn thigh tati gn d hype esthesa are R s i g sign bound t d rness comm Rectal t nd rnes rar				Psoas gn thigh tatio gn d ectal tenderns contum n tain postu ns f ppe di Hype esthes rebo d t nd rness d R sang sign ft p ese t			

TABLE I—CLINICAL FEATURES OF ACUTE CECAL AMEBIASIS AND DIAGNOSIS FROM ACUTE APPENDICITIS—Continued

Acute Cecal Amebiasis

Acute Appendicitis

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ecum present and roughened and injected surface. There is no fecal discharge and exploration of the cecum is delayed. On removal of the appendix, the cecum is found to be mucous and the mucosa was very swollen and howd numerous small areas of hemorrhage although trauma from handling had been excluded to a minimum. The caliber of the lumen was much reduced by the edema. Microscopic examination of the contents showed pus cells, red blood cells and mucus. Histology of the cecum showed the mucosa to be inflamed and the mucosal glands to be atrophic. The mucosa was found to be ulcerated in places and in places the mucosa was found to be necrotic. The mucosa was found to be ulcerated in places and in places the mucosa was found to be necrotic. The mucosa was found to be ulcerated in places and in places the mucosa was found to be necrotic.

Further examination of the cecum showed the mucosa to be inflamed and the mucosal glands to be atrophic. The mucosa was found to be ulcerated in places and in places the mucosa was found to be necrotic. The mucosa was found to be ulcerated in places and in places the mucosa was found to be necrotic. The mucosa was found to be ulcerated in places and in places the mucosa was found to be necrotic.

This appears to have been an example of amebic appendicitis even though the *Endamoeba histolytica* was not found in the actual tissues. Although examinations of the stools and sigmoidoscopy repeatedly proved negative evidence of amebiasis of both cecum and appendix was found at operation.

The third condition for discussion with acute cecal amebiasis is the acute cecal ame-

boma which is occasionally found when resolution of an acute attack of cecal amebiasis is delayed and is more likely to develop if emetine is omitted. In the early stages tenderness and rigidity tend to obscure the mass later when the tenderness is less and the rigidity disappears it is more easily defined. The temperature and pulse are little affected and even in the presence of a large mass which may involve the ascending colon the constitutional disturbance is rarely severe. Exacerbations are not uncommon and are accompanied by an increase in the local signs and a moderate rise of temperature and pulse. A slight rise in the leucocyte count of the type noted in Table I is usual.

However suggestive an abdominal mass may appear of appendicitis in patients who have lived in endemic areas before operation is advised investigation should be undertaken to exclude amebiasis. In our experience sigmoidoscopy is not often helpful in this condition and repeated examination of the stools quite commonly proves negative. The response to emetine is very much more constant but if this fails laparotomy will be required for diagnosis. The following case of ameboma presented some interesting features.

In September 1942 D. J. aged 30 years was treated with emetine grains and sulfanilamide for a diagnosis of amebic dysentery. He was admitted to hospital on December 8, 1942 because of further diarrhea. Endamoeba histolytica

was found in the stools and emetine and calomel were given with complete relief of symptoms. On January 6 amebic cultures (further confirmed by examination of the discharge) showed trophozoites. Quinhydrone was given both orally and by the rectum but although the diarrhea did not recur a serious deterioration in his general condition set in for which detailed investigation failed to find a cause. On February 6 he came to the hospital for an examination and a mass was discovered. A surgical opinion was obtained to exclude appendicitis. The swelling was tender and fixed and about the size of a closed fist but there was no rigidity. He was a little slightly tender in the left iliac fossa and there was a slight increase in temperature and pulse. Other investigation showed general conditions were negative and the diagnosis of ameboma was accepted.

During the next week the temperature and pulse failed to settle and there was no change in his condition except for the appearance of a moderate degree of rigidity and some increase in the temperature. On February 1 emetine was resumed at a weekly therapeutic dose. A remarkable reduction had occurred in the mass although the diarrhea with blood and amebae had returned. Quinhydrone and carbazone were prescribed and a great improvement in general condition followed. By the end of February the swelling was gone of cecal thickening. During March he had moderate abdominal pain going with diarrhea and amebae in the stool. A small course of emetine, carbazone and quinhydrone was commenced on March 8 and when he was transferred to another hospital on April 9 for treatment his general condition was much improved.

Relapse after emetine even when supplemented with other drugs is not uncommon. Emetine bismuth iodide was not available at the time and it was only after every consideration that the physicians prescribed emetine to the extent of a total of 41 grains. Serious constitutional disturbance is unusual with ameboma and it is probable that some other agent was responsible in this case.

The diagnosis of acute cecal amebiasis from appendicitis. More than 30 years ago Rogers (35) described cecal thickening in cases of amebic dysentery which simulated appendicitis and which he had seen mistaken by physicians and surgeon and in which the appendix proved not to be involved. Many surgeons have been interested in this problem and there is ample evidence to support the view that surgeons who work in tropical countries have found that they must be constantly on their guard to avoid operation in cases of amebic dysentery under the diagnosis of appendicitis (6, 1, 23). Even in temper-

ate climates the same difficulty may arise as was witnessed during the Chicago epidemic of 1933-1934 when of 113 cases of amebic dysentery 32 were diagnosed as appendicitis and submitted to operation.

In the remarks which follow no special reference will be made to amebic appendicitis as this is merely an extension of the infection from the cecum. The immediate diagnosis of acute cecal amebiasis is essentially clinical and laboratory confirmation must come later. As a general rule there is little difficulty in diagnosis—especially when there is evidence of involvement of the more distal colon or liver. When the disease is confined to the cecum the distinction becomes finer and occasionally the disease so closely simulates appendicitis that recognition is not possible by the clinical method at our disposal. Surgeons necessarily meet a high proportion of the more difficult cases but on account of the special risks of operation on the amebic abdomen every effort should be made to arrive at a diagnosis without resort to laparotomy although this must be advised if there is serious doubt.

The individual items of diagnosis are presented in Table I but a few general observations will be added.

The manifestations of acute cecal amebiasis are much less constant than those of appendicitis and even when there is considerable resemblance it is usually possible to recognize some essential feature which cannot be integrated into the typical pattern of appendicitis. On the other hand the unexpected irregular attack of appendicitis is in the tropics very liable to be mistaken for dysentery especially if the typical history is lacking. In the high retrocecal position with comparatively mild symptoms appendicitis may suggest amebiasis of the cecum or in the pelvic position with hypogastric pain it may lead to a suspicion of dysentery affecting the distal colon. Acute appendicitis associated with diarrhea is of course a well known trap.

In distinguishing these conditions in which the clinical features may be so similar success often depends on details—detail of the previous history of any premonitory symptoms of the onset and progress of the attack and of

the individual signs and symptoms. Rayner's observation, the old dictum quick in and quicker out, has long since been obsolete. Always there is time to make a considered diagnosis as there is to do a careful and gentle operation (34); even more applicable to the diagnosis of appendicitis in the tropics than in temperate climates and in any case of suspected appendicitis amebiasis must always be excluded.

The local signs of acute cecal amebiasis commonly appear earlier and are at first more diffuse than those of appendicitis, but they are by no means constant and not infrequently appear most suggestive of acute appendicitis. A common error is to exaggerate the importance of the local physical signs while neglecting the general aspects of the case. We have seen many examples of amebiasis diagnosed as appendicitis on this account. Failure to appreciate that the onset of an attack of cecal amebiasis may be very abrupt and that diarrhea is frequently absent during the first few days are other causes of misdiagnosis.

As already noted the individual signs and symptoms in amebiasis are much less constant than those of acute appendicitis; this inconstancy applies also to the order of their appearance. In acute appendicitis exceptions to the rule. First and all the time the pain, next nausea, then tenderness and finally fever with leucocytosis are remarkably rare (9, 20) but in acute cecal amebiasis no set order applies.

Occasionally acute abdominal pains develop during the course of an attack of amebic dysentery and center in the right iliac fossa. The differential diagnosis then includes (a) an exacerbation of cecal amebiasis with or without extension to the appendix, (b) nonamebic acute appendicitis and (c) perforation of an amebic ulcer. The diagnosis of perforation will not be considered further. The evidence may be sufficient to enable a definite diagnosis to be made in the more severe attacks of nonamebic appendicitis especially of the obstructive variety or at least to leave no doubt about the necessity for exploration. More often it is less convincing and a frequent result of exploration under these conditions has been the discovery of acute amebiasis of the cecum and at times also of the appendix but not a surgical

appendicitis (1). In the clinically less severe attacks any bias should be in the direction of amebiasis.

The indications for operation in the doubtful case. When the diagnosis remains in doubt two considerations must be weighed in the balance: the dangers of postponing operation in acute appendicitis and the special risks of operation in intestinal amebiasis. (The reader is referred to the section, Operations in Relation to Intestinal Amebiasis which follows.) The danger of delay in appendicitis needs no comment and examples of apparently mild attacks which at operation prove to be much more serious are by no means rare. Nevertheless when amebiasis is the alternative diagnosis with the attendant risks from operation a conservative attitude may well be the safer policy if all the clinical evidence points to a mild attack.

If a severe attack of appendicitis cannot be excluded with reasonable certainty exploration must be advised. For the obviously mild attack and the attack which appears to be settling down conservative measures with emetine should be given a trial. When acute symptoms develop during an attack of amebic dysentery exploration is indicated if the attack is clinically severe but with less severe symptoms the bias should be against operation. When there is a localized mass in the right iliac fossa whether the cause is ameboma or acute appendicitis there is no indication for immediate interference; the attack should be treated conservatively with emetine. Operation is required only if an abscess develops or if the mass persists when it becomes necessary to exclude such lesions as tuberculosis, ileitis and carcinoma.

In perspective. Attention has been focused on acute cecal amebiasis and its diagnosis from acute appendicitis. Amebic infections may of course localize in other parts of the large intestine with effects analogous to those described. The possibility of other important diseases which may present a similar clinical picture must not be overlooked. These include malaria, hepatitis, both amebic and infective typhoid, cholecystitis, ulcerative colitis and some forms of bacillary dysentery; all may give rise to acute abdominal symptoms

which may concentrate in the lower right quadrant of the abdomen. Their salient features are well known and will not be described.

CHRONIC INTESTINAL AMEBIASIS

Amebiasis and chronic appendicitis The high incidence of amebiasis among soldiers serving overseas and its tendency to persist for long period and to relapse make this subject exceptionally important. After the war postdysenteric abdominal disorders will undoubtedly appear frequently in general surgical practice. For purpose of discussion patients may be divided into two groups: (a) those who have lived in endemic areas but give no history of infection and (b) those who have had intestinal amebiasis.

In the first group the possibility of unsuspected intestinal amebiasis as a cause of the symptoms must not be overlooked. However suggestive the case may be of appendicular disease, operation is not to be advised until amebiasis has been excluded by adequate investigation. Clinical features which suggest amebiasis are a characteristic diffuse rather than localized thickening of the cecum, a tender firm sigmoid colon, and tenderness or enlargement of the liver. Tenderness and thickening is sometimes present over other parts of the colon. Investigation will include frequently repeated examination of the stools, sigmoidoscopy, and x-ray examination—this may reveal unsuspected disease in the colon. If after complete investigation there is no evidence of amebiasis, operation will be advised on ordinary surgical principles.

In the second group of patients symptoms are often too readily assumed to be the result of chronic inflammatory changes in the appendix caused by the attack of dysentery for which operation is necessary. It is important to remember that the patient having already had dysentery is liable to relapse or may have been reinfected and symptoms which are very suggestive of appendicitis may be produced. In addition however the possibility of postdysenteric intestinal symptoms of nonappendicular origin must be considered. Such symptoms may be due to a neurosis or to functional disturbances of the bowel or to organic changes such as scarring and adhe-

sions attributable to the previous dysentery. Dyspepsia, anorexia, abdominal discomfort, irregularity of the bowels, and pain and tenderness in the right iliac fossa may be very suggestive of appendicular disease but more often result from one of the other conditions. Even if the appendix is at fault the lesion may be an amebic appendicitis which may well respond to medical treatment. Moreover many patients given time recover spontaneously. For patients who fall into this group if there is a history of recent dysentery, observation for some months is advisable before operation is resorted to, and in all cases the question of a trial of emetine or other amebicide should be considered by a physician.

(Banerji and Chopra recommend an interval operation for every case in which the appendix appears to be acutely involved during the course of an attack of cecal amebiasis. They state that patients are liable to subsequent attacks of appendicitis either as a result of chronic inflammatory changes in the appendix or a recurrence of amebic lesions in the appendix. It is not unusual to find gross changes of the type noted in the section on pathology in appendices removed at interval operation, but we would recommend operation for amebic appendicitis only when every effort to cure the condition by medical measures has failed—unless of course some complication intervened. At present interval operation following acute cecal amebiasis is usually reserved for cases in which evidence of appendicitis persists after apparent cure of the cecal amebiasis. There is need for further investigation on this point because Banerji and Chopra base their opinion on an extensive experience.)

Finally attention is directed to the unsatisfactory results which follow indiscriminate appendectomy in endemic regions. Rogers disclosed that a considerable number of chronic dysenteric patients were found by the India office to have had their appendices removed without lasting benefit (36). If a repetition of this experience is to be avoided, appendectomy must be reserved for carefully selected patients.

Localized chronic amebic lesions of the cecum and colon The diffuse form of amebic colitis

which may simulate chronic appendicitis, cholecystitis and duodenal ulcers is well known but the localized lesion with solitary or multiple ulcers, thickening of the bowel and often a palpable mass has received little attention in general surgery. It is a rare lesion and the counterpart of the ameboma which occurs in the acute state and like it is of surgical interest chiefly because it is so liable to be mistaken for a surgical condition. Occasionally the disease causes an obstruction which requires operation. Typical cases have been described in the literature (15, 18, 32, 37, 43) and the difficulties of diagnosis and the dangers attendant on operation in unsuspected cases are well described. These dangers were clearly revealed during the Chicago epidemic and no doubt the publicity which followed ensured their wider recognition. However the time has not yet arrived when a majority of surgeons would subscribe to Simon's experience whereas the previous tendency was to overlook amebiasis and to diagnose carcinoma or tuberculosis now the tendency is in the opposite direction.

The clinical features require no elaboration and will be referred to in general terms only in order to emphasize their close similarity to those of other granulomas and neoplasms of the bowel. In all the effects depend on the portion of the intestine involved, the extent of the ulceration and the degree of mechanical obstruction. As is well known while in lesions of the lower part of the colon alternating diarrhea and constipation and the passage of blood and mucus are usual in the midcolon obstructive symptoms are likely to predominate. In the proximal colon especially in the cecum a mass of considerable size may develop identically as far as bowel symptoms are concerned although reflex gastrointestinal symptoms may occur. Palpation may reveal the presence of a mass and radiological examination will define its position and extent. A history of previous dysentery would merely indicate the necessity of special investigation.

It is generally agreed that radiological appearances are not pathognomonic of this condition. Deformities of the cecum due to contraction and induration such as a coned appearance have been described but they are

neither constant nor distinctive (27). Deformity of the colon from ulceration or fibrosis may be marked but cannot be distinguished with certainty from other inflammatory or malignant conditions. Extensive deformity would support the diagnosis of amebiasis but Ikeda's opinion that the chief value of radiology is the diagnosis of the site and extent of these lesions and as a control of treatment represents the limitations of the method.

Differential diagnosis from carcinoma, tuberculosis, diverticulitis and rarer conditions such as regional ileitis, actinomycosis and chronic bacillary lesions involves the accepted clinical, radiological and laboratory investigations and may provide conclusive evidence of one or other of these diseases. In this variety of amebiasis neither clinical nor radiological features are distinctive and diagnosis depends on the discovery of the ameba and the diagnostic use of emetine.

The detection of the *E. histolytica* in the stools may prove difficult and the greatest importance is attached to the details to be observed in the selection of specimens for examination and the immediate examination of fresh specimens on several successive days (25). Sigmoidoscopy may succeed when the stool tests fail but as would be expected the percentage of positive results will be small when the proximal colon is affected. Finally, emetine should always be employed for the diagnosis of tumors of the large intestine in patients who have lived in endemic areas whether the *E. histolytica* has been isolated or not. The effect should be assessed not only by clinical, laboratory and radiological examinations but also when applicable by sigmoidoscopy. Most amebic lesions respond conclusively but in some of the fibrous forms emetine has little effect. In view of the possible coexistence of other lesions if complete resolution is not obtained biopsy or excision then becomes necessary.

Two cases will be described to illustrate some of the points raised.

✓ M. E. an officer's wife aged 32 years was seen in consultation as a patient on November 1942. She complained of pain in the right iliac fossa off and on for about 2 months and of occasional mild fever and some loss of weight. Her appendix had

been emended when she was 8 years old and at 27 she had amebic dysentery. She had recently been investigated in the hospital where a mass was discovered in the cecal area. The stools were negative and x-ray showed irregularity of the cecum and small intestine in emptying of the ileum. She had been admitted to hospital for tomy on the provision of diagnosis of tuberculosis. On examination there was found a slightly tender mass corresponding in size and position with the cecum as seen in the x-ray picture. No other abnormality was noted. She was discharged to her father in the instigation of her symptoms. Operation but while a waiting admission she developed another attack of amebic dysentery. Six weeks later after routine treatment he weight had increased. Her abdominal symptoms were almost completely relieved and the evidence was no sign of the mass present in the right iliac fossa.

✓ L. H. aged 5 years was admitted on February 13, 1944 with diarrhea and vomiting of about 12 hours duration. He had suffered from intermittent attacks of diarrhea, flatulence and colic for about 3 months and considerable loss of weight.

Bacillary dysentery was at first suspected but sulfonamides only brought partial relief. The diarrhea and the stools continued to show blood and sometimes inflammatory exudate but no mucus. Another examination of the stool in the right hypochondrium below the liver. Further stool examinations resulted in the discovery of Endamoeba histolytica by the wet mount and cysts on February 23. After a course of emetine his general condition was considerably improved and the diarrhea was completely cured but the mass remained unaffected. Another examination on March 9 showed a constant filling defect of the ring type in the right half of the transverse colon. Repeated examination of the rectum and sigmoidoscopy produced no evidence of amebiasis.

At operation on March 8 for suspected carcinoma a wedge resection of the terminal ileum, cecum and colon was performed for a tumor in the site indicated by x-ray film. The macroscopically normal, deeply enlarged but rather weightless node of the hepatic metastases. The remaining distal ileum and colon were cut to provide a colostomy.

The specimen presented a typical carcinoma of the ulcer most encircling the bowel and three small ulcers of the subcoral type. Scrapings from the ulcers failed to show amebae and microscopic examination of the large, clear, howdood colonic glands contained no inflammatory changes in the glands. Conclusion: cancer was ventral adeno-carcinoma. Later the colostomy was successfully closed.

AMEBIASIS OF THE RECTUM AND ANAL CANAL

Amebiasis of the rectum and anal canal will be considered in two parts: amebiasis in relation to simple conditions such as piles, fissure, fistula and fibrous stricture and amebic conditions simulating neoplasm.

The piles both internal and external which so commonly accompany an attack of amebic dysentery usually resolve as the dysentery is brought under control although in exceptional cases operation is required at a later date. Prolapse acts in a similar manner. Piles due to mild or chronic dysentery are of greater surgical importance for the dysentery may be far from obvious and operation may be advised. (17) Such cases are potential surgical catastrophes and interference may be followed by an acute exacerbation of the dysentery—a most unwelcome sequel to a rectal operation—and by severe local complications and even by liver abscess. McCoy reports that 6 patients suffering from dysentery during the Chicago epidemic were submitted to operation for piles, one of whom died.

In our experience in an endemic area among the patients referred to hospital for the treatment of piles and fissures many were found to have amebic dysentery or amebic proctitis. There was often no history to suggest dysentery and some patients had been cured of this condition in the past. Proctoscopic examination alone is not sufficient and sigmoidoscopy and repeated stool examinations may be required to bring to light the less obvious amebic infections. It is thought that post-operative troubles such as ulceration and scarring which appear to be more liable to occur in the tropics than in temperate climates are often caused by unsuspected dysentery.

Among the less common complications of amebiasis are conditions such as fistula in ano, anorectal abscess and perianal ulceration. It is often not possible to find the ameba in the discharge but examination of scrapings from the walls of the cavity is more successful. Biopsy may be used to establish the diagnosis although in most cases spectacular confirmation is provided by the response to emetine.

Jackman noted the low incidence of fistula and anorectal abscess in this disease and contrasted his figure of 1.7 per cent with the 30 per cent he found in cases of regional ileitis and 8.4 per cent in ulcerative colitis. Two instances of fistula in ano occurred in our series. Extensive perianal ulceration was commonplace before the introduction of modern treatment but is rarely seen today and on

that account the diagnosis may be missed in chronic cases. Gabriel described a remarkable example in which wide predilection ulceration followed the rupture of an anal abscess in a patient who gave no history of dysentery the condition responded to emetine. One of our patients seriously ill with longstanding amebic dysentery developed an extensive perianal ulceration with much overgrowth of granulation tissue which was very suggestive of condylomas in appearance. The Wassermann reaction was negative and the condition ultimately resolved completely without contraction on treatment with emetine carbazonne quinoxyl and simple local applications. The following cases are of relevant interest.

J. T. aged 35 years was admitted for operation for piles in September 22 1942. There was no history of dysentery and apart from a mass of internal piles proctoscopy showed no abnormality. The operation of excision and ligation was performed and progress was satisfactory until the end of the second week when he complained of pain in the right shoulder and right hypochondrium. The peritonitis was almost healed but the liver as tested and a remittent pyrexia without rigors followed. Blood counts showed a leucocytosis with a slight excess of polymorphonuclears. Serial rectal cultures revealed progressive elevation of the right lobe of the diaphragm. Treatment with emetine gave no therapeutic improvement. Aspiration was carried out and thick pus was evacuated. The wound site showed degenerated pericellulitis and abscesses. The patient was gradually and lovingly nursed and on October 16 underwent a second operation with peritonitis, osteomyelitis of the ribs, abscesses, latent malarial infection, diarrhoea, and indigestion. The patient died of amoebic infection and further treatment for syphilis and convalescence. On April 18 repeated examination of the stools failed to detect the disease.

This patient was admitted before repeated examinations of the stools and sigmoidoscopy were adopted as a routine preoperative measure in cases of piles although it may be noted that after operation and before emetine was given the stools were negative.

Nevertheless it seems probable that the abscess was related to his operation.

J. F. D. aged 35 years was admitted on August 6 1943 in a very toxic condition and complained of severe talpalgia and diarrhoea. The blood count was normal. He died of the disease on July 7 3 days later he felt

very poorly but as he was engaged in jungle training he tried to carry on. Eventually he reported to his doctor who noted that his temperature was 103.1 degrees and sent him to hospital.

On examination apart from his rectal condition there was found no abnormality for his high fever and to emetine. The white blood count was 20,916 (polymorphonuclears 78 per cent leucocytes 21 per cent). On microscopic examination of the rectal discharge blood and pus were seen but no sign of amoebae. An anasthetic was necessary to permit examination of the rectum. Proctatic and perirectal abscesses were excluded. Very inflamed piles were seen and the whole area within range of the proctoscope was intensely congested. Smears were examined with the same result as before.

Sulfonamide treatment failed to reduce the toxemia and on August 13 a sigmoidoscopy was performed. On account of the intense infection examination was restricted to the anal canal and lower part of the rectum. On this occasion smears taken from the rectal walls were found to contain the *Endamoeba histolytica*. Emetine was rapidly effective and a fortnight later sigmoidoscopy revealed no evidence of inflammation.

This exceptional case illustrates the grave danger which may attend even such a minor surgical procedure in the presence of an amebic infection.

Fibrous stricture. Contrary to earlier opinion the view is now held that amebic dysentery rarely produces fibrous stricture of the rectum. It is often impossible to determine the nature of the infection concerned for apart from conditions such as syphilis and lymphogranuloma stricture may follow many varieties of proctitis due to non-specific causes. Even when strictures result from amebic infections the identification of the amoeba may present great difficulty.

The only example of fibrous stricture of the rectum which occurred in our series was found in the following patient.

W. D. aged 28 years was admitted for proctodysentery of 4 months duration on July 1 1943. After treatment with emetine carbazonne and quinoxyl he complained of increasing difficulty in passing motions. He was found to have a double stricture affecting the upper part of the anal canal and lower part of the rectum which was clearly fibrous and would only admit the little finger with difficulty. Intermittent dilatation resulted in a great improvement. Although ulceration was found between the strictures amoebae could not be detected. The craps from the stricture were the stool. Biopsy disclosed non-specific chronic inflammation consisting only of the Wassermann reaction was

negative. The cause is established to account for the structure.

Amebic lesions of the rectum simulating neoplasm. In intestinal amebiasis of long standing multiple polypoidal excrescences of granulation tissue or edematous mucosa are sometimes seen at sigmoidoscopy and may be mistaken for simple neoplasms. They usually disappear when emetine is used—if not biopsy will be required for diagnosis.

In recent years attention has been focused on the chronic amebic ulcer or area of granulation tissue which may assume the clinical appearances of carcinoma of the rectum (27, 3, 43). Typical amebic ulcers are occasionally seen at a higher level but in many cases the lesion exists alone. A short history, extensive involvement of the rectal wall and absence of the typical induration of carcinoma are suggestive of amebiasis but frequent examples occur in which the clinical features cannot be distinguished from those of malignancy. Differential diagnosis includes the discovery of the ameba in the stool or in scrapings from the ulcerated surface but the possible coexistence of carcinoma demands close observation of the effects of emetine and occasionally biopsy.

This type of amebic lesion is to be expected from time to time among soldiers on their return home from endemic areas—the writer saw 6 examples during a period of 3 years in India—and on that account 2 typical cases will be described.

During the withdrawal from Burma H. S. aged 35 years developed abdominal pain and diarrhea. He was admitted to a hospital in Arrah in India. The diarrhea had subsided but an inflammatory mass was found in the right iliac fossa which persisted for some weeks and appendix abscess was diagnosed. Eventually he sent on leave and appendixectomy was recommended when he was fit. While in the hospital the pain and diarrhea returned and he was admitted to another hospital. There the possibility of a pelvic abscess was at first considered on account of a moderate fever and the passage of blood-stained mucus which did not reveal ameba. When the surgical possibilities were excluded in the rectum which was rigidly congested with carcinoma a second operation was obtained.

When seen on October 5, 1942 he was still suffering from diarrhea whereas in the interval blood-stained discharge. He had lost weight and the weight and haemoglobin did not rise as rapidly. Abdominal

examination was negative but on rectal examination the lower edge of an indurated mass was felt above the internal sphincter and about 15 cm irregular ulcerated surface extended out from the finger. Sigmoidoscopy disclosed an ulcer occupied the anterior and lateral walls of the rectum between the third and fourth inches from the anus. Encroachment on the lumbar and rectal passages of the instrument difficult but the upper extremity appeared normal. Both clinical examination and sigmoidoscopy both confirmed the diagnosis of ulcerative colitis. Specimens were taken on the next day and a lumbar diastasis was found on dissection considerable numbers of amebae in the stool and histology.

The treatment with emetine was rapidly effective. Diarrhea was relieved and weight and strength were regained. Repeated sigmoidoscopy confirmed the clinical improvement and within a month the rectum had returned to normal. The patient was advised to have his appendix removed at a later date although it appeared probable that his appendix abscess was in reality an amebic infection.

J. L. aged 2 years was in hospital on October 1942 for amebic dysentery. A history of repeated attacks of treatment with emetine, calomel and quinine. He was readmitted on July 16, 1943 for a recurrence. The Endamoeba histolytica was again found in the stool. Chills and pot-smell in the mouth (and an equal effect on emetine bismuth iodide) were produced. Although the stools continued loose they were again free of amebae on February 8 and 1. Sigmoidoscopy on February 10 disclosed an ulcer with thick edge and an irregular ulcer covered with blood and mucus occupying about the fourth of the circumference of the rectum. The distal colon was intact. The ulcer extended posteriorly for about an inch and to the left and the naked eye might well have been misled. The high rectum was free of the disease. The ulcer appeared to be a deep fissure of the ulcer contained Endamoeba histolytica. Emetine was given and dissolved in the stool. He appeared in the stool after 12 grains had been taken. They were again in the stool. The treatment was completed and sigmoidoscopy on March 13 the ulcer was gone and the distal colon was free of the disease. The ulcer had occupied the cecum and the sigmoidoscopy procedure was abnormal.

A NOTE ON SIGMOIDOSCOPY

Apart from the obvious advantage in appropriate cases of obtaining a specimen for diagnosis directly from the surface of an amebic ulcer or for histological examination sigmoidoscopy provides a valuable method of confirm-

ing the effects of emetine when used for diagnostic or therapeutic purposes and for the exclusion of other lesions such as carcinoma which may coexist with amebiasis.

We have frequently found the *Endamoeba histolytica* in specimens at sigmoidoscopy when the stools had proved repeatedly negative and have discovered still active ulceration when all other evidence indicated a complete cure from treatment. Jackman advocates routine sigmoidoscopy for every case in which amebiasis is suspected on the grounds that the occasional coexistence of neoplasm is sufficiently frequent to warrant this step. The method is included as part of the routine investigation of amebic dysentery in British Military Hospitals in the East.

Various estimates have been given of the percentage of cases of intestinal amebiasis in which lesions may be found at sigmoidoscopy. Manson Bahr reports at least 80 per cent while Jackman's figure is 20.8 per cent. The surgeon is more concerned with a selected group of cases in which the lesion is localized and on that account the method is most useful in rectal and sigmoid lesions. We have had positive results in about 10 per cent of attacks which on clinical examination appear to be confined to the cecum.

For a description of the methods of preparation the sigmoidoscopic appearances of amebiasis and their differential diagnosis the reader is referred to publications by Manson Bahr and Biggam (4, 26, 27).

OPERATIONS IN RELATION TO INTESTINAL AMEBIASIS

Operations which involve disturbance to the bowel which has been infected by the *Endamoeba histolytica* are liable to be followed by certain complications related to this infection. A brief summary is presented.

Acute exacerbation of amebic dysentery. A localized amebiasis may be transformed into a diffuse type occasionally of great severity. After intestinal suture and rectal operations the effects at the site of operation may be serious.

Local and distant septic complications. These are common and may prove fatal. Many examples appear in the literature of

conditions such as pericolic abscess, gangrene of the bowel, peritonitis and hepatic abscess in some of which the appearances at operation gave no cause for alarm.

Intestinal hemorrhage. Barry and Crump and Cope have emphasized the special risk of hemorrhage from amebic ulcers after operation, most commonly in cases of cecal amebiasis.

Delay or failure of the normal repair processes. Prolonged delay in healing and spreading ulceration of the abdominal wall were often seen before the introduction of emetine and may occur in examples of unsuspected amebiasis. Failure at the suture line in cases of anastomosis figures prominently in the published cases. Possibly the lack of round celled and fibroblastic reaction which is found in certain circumstances in amebic infections is related to the incidence of these complications.

These dangers are well known and a surgeon's individual experience is therefore limited. Three examples are described in this paper: a case of fulminating cecal amebiasis and 2 rectal cases, but other examples have occurred among surgeons of our acquaintance. The most convincing evidence is presented in the reports of the Chicago epidemic although it should be noted that the incidence of severe attacks was exceptionally high. In the early stages the number of deaths following operations for suspected surgical conditions assumed such proportions that the Public Health authorities found it necessary to take exceptional measures to advise doctors in the wide area concerned on the diagnosis and treatment of amebiasis. (5) The mortality of the 1215 cases traced was 7 per cent. McCoy reports 13 deaths among 32 patients submitted to appendicectomy and other deaths after operation for cholecystitis and carcinoma of the colon. In all these cases amebiasis had not been diagnosed. In 50 per cent of the fatal cases misdiagnoses were reported and in more than two-thirds of these the illness had been handled as a surgical disease. In no instance did a fatality follow early consultation, prompt diagnosis and specific treatment. (28)

In spite of these dangers exploratory operation is occasionally necessary, as for example when the diagnosis between cecal and amebic

asis and appendicitis remains in doubt. Simple exploration with no further procedure if amebiasis is found might appear ideal but certain disadvantages must be recognized. A mildly infected cecum may show no external evidence of amebiasis and there is a distinct possibility of treating such a case as an ordinary appendicitis. Any manipulation of the cecum may lead to a flare up of the amebic infection but if appendicectomy is performed the risks are much increased. In severe attacks the two diseases may present very similar appearances and it is sometimes impossible to distinguish them at operation. Adequate exposure is necessary and the cecum may be adherent or the appendix difficult of access—conditions which may involve manipulation and predispose to complications. In the case of a cecal ameboma the appendix may be very adherent, the tissues friable and bleeding may prove most troublesome—quite apart from the danger of bleeding into the cecum—and the removal of the appendix may be both difficult and dangerous.

During operation handling of the cecum should be restricted as far as possible. If amebiasis is recognized the appendix should not be removed unless it obviously constitutes a danger. When the appearances are inconclusive in the cecal area typical changes may occasionally be seen in the more distal colon but if not appendicectomy is generally to be advised and the contents examined at once for the *Endamoeba histolytica*.

The foregoing observations endorse the view previously expressed when the indications for exploration in doubtful cases were discussed that in endemic areas every effort should be made to arrive at a clinical diagnosis without resort to laparotomy.

In the past indications for operations such as appendicostomy and cecostomy were described (10) for the treatment of intestinal amebiasis which remained uncontrolled by medical measures but today the majority of surgeons concur with Craig when he condemns their use. With the exception of rare complications which have not responded to the available drugs such as anorectal fistula colostomy is also inadvisable. These operations are all liable to the complications de-

scribed here and peritonitis is very liable to arise in the vicinity of the wound. Even when the disease is apparently confined to the distal colon it is not possible to exclude amebiasis in the more proximal bowel.

The futility of colostomy for the control of active amebic infection in the distal colon is indicated by Manson Bahr's observation.

When colostomy is undertaken in the presence of amebiasis on the mistaken impression that the symptoms are those of carcinoma the process of amebic ulceration is accentuated rather than retarded. (27)

Appendicostomy and cecostomy have been employed for the purpose of lavage but the advantage over the rectal route is very questionable. Neither operation provides rest to the large intestine. This object can be effectively secured by ileostomy, an operation which may have a limited application in selected cases resistant to other treatment. (9)

To sum up, excluding perforation abscess and obstruction there are few exceptions to the rule that operation is strongly contraindicated in intestinal amebiasis. These include the removal of an ameboma which fails to respond to medical treatment, the provision of a colostomy for rare cases of intractable anorectal fistula and possibly the performance of ileostomy in selected resistant cases of intestinal amebiasis. Interval operation may be advisable after an attack of acute cecal amebiasis and exploration may be required in doubtful cases.

Finally an important fact emerges from the study of the published cases—in a high proportion of those which ended fatally emetine was omitted or only commenced late after operation when the ameba was discovered in the stools. According to Strong the curative action of emetine often stands in direct relation to its early employment in the attack. (40) Operation may be necessary in known cases of amebiasis and in these the sooner emetine is given the better in reasonable doses any depressant effect on the heart is more than outweighed by the beneficial effect on the toxæmia. (6) When the diagnosis is in-

African cases of amebiasis published since 1920 as failures to discover the *E. damoeba* histolytica by peritoneal or rectal examination although post-mortem examination revealed intestinal amebiasis.

doubt if there is strong suspicion of this disease at operation it is unwise to delay its use until positive evidence is forthcoming

SUMMARY AND CONCLUSIONS

Intestinal amebiasis is the disease of major surgical importance in endemic areas. With the return of the forces from the East examples of this disease must be expected in general practice at home.

The clinical and radiological manifestations of the localized forms of intestinal amebiasis may be indistinguishable from those of surgical diseases acute or chronic. It is usually but not always possible to find the *Endamoeba histolytica* in the stools, sigmoidoscopy may succeed when examination of the stools fails. The response to emetine is of considerable diagnostic significance but occasionally the condition is resistant to the drug and exploration or biopsy is then required. The possible coexistence of amebiasis with other lesions must not be overlooked.

Perforation of an amebic ulcer is to be expected in less than 3 per cent of cases. It is most often associated with fulminating infections. Toxemia may mask the clinical signs and if gangrene is present recovery even with operation is very unlikely.

The clinical features of acute cecal amebiasis and acute appendicitis have much in common; the differential diagnosis may present great difficulty but in view of the special risks of operation in cases of cecal amebiasis every endeavor should be made to obtain a clinical diagnosis. If exploration proves necessary manipulation of the cecum should be avoided as far as possible and unless the appendix is obviously in a dangerous condition it should not be removed if amebiasis is found; emetine should be given at once after operation.

However suggestive of acute appendicitis operation should not be advised in any case with an inflammatory mass until cecal amebiasis has been excluded. Amebic appendicitis is regarded for purpose of diagnosis and treatment as an extension of cecal amebiasis—unless complicated by abscess or perforation it is a medical disease.

Unruptured intestinal amebiasis and post-dysenteric conditions of nonappendicular

origin often give rise to symptoms very suggestive of chronic appendicitis. Before appendicectomy is advised these conditions must be carefully excluded. Operations occasionally required for residual appendicular disease following cecal amebiasis.

Examples of localized chronic amebic colitis and ulceration of the rectum which may be mistaken for carcinoma or other surgical disease are common in endemic areas. Minor anorectal conditions such as piles fissure and fistula may result from unsuspected mild or chronic amebiasis.

With few exceptions abdominal or rectal operations are strongly contraindicated in patients suffering from intestinal amebiasis—they are often followed by serious complications peculiar to this disease. If operation is necessary or if amebiasis is discovered at exploratory operation the sooner emetine is commenced the better. Appendicostomy and cecostomy have no place in the treatment of this condition.

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THE SURGICAL TREATMENT OF INJURIES OF THE BRAIN SPINAL CORD AND PERIPHERAL NERVES

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CRANIOCEPHEAL INJURIES

THE recognition of craniocerebral injuries presents no problem. Evaluation of the extent of the damage, however, is often difficult or impossible during the first few hours after the injury. In closed head injuries intracranial hemorrhage is potentially present in every case. In compound head injuries correct appraisal is usually impossible before x-ray pictures of the skull have been taken. The clinical course observed for a period of time or surgical exploration carried out. Small lacerations of the scalp may be associated with extensive fissure fractures, comminuted or depressed fractures of the skull or with serious intracranial bleeding. This is especially true in the case of penetrating wounds which have been inflicted by small missiles.

IMMEDIATE TREATMENT

The earliest possible removal of patients with craniocerebral injuries to a hospital where intracranial bleeding can be controlled and definitive intracranial surgery as needed can be performed is the basic principle in the immediate treatment of these injuries. Emergency treatment has for its sole purpose the preparation of the injured man for this evacuation. Specific methods of treatment for cerebral concussion and edema are all of questionable therapeutic worth and need not be undertaken. If there are scalp wounds the hair should be cut for several inches about them with clippers or scissors but a razor should not be used at this time. Bleeding from open wounds of the scalp can usually be controlled by firm pressure dressings. Ligature of the larger arteries of the scalp is unsatisfactory and often impossible due to retraction of these vessels into the scalp. Troublesome bleeding from this source is best controlled by mattress sutures about bleeding vessels. Wounds should not be explored, irrigated, debrided or su-

tured. Sulfanilamide powder¹ should be dusted into all wounds in 5 gram quantities. Dressings of gauze should be large enough to cover the wound generously and should be firmly applied with a bandage which covers the entire head. As long as it remains in place it should not be changed until the patient reaches the hospital where definitive treatment is to be given.

Blood lost through external hemorrhage from the scalp if great should be replaced exactly as it is in wounds of other parts of the body. Bleeding from the ears should be treated simply by covering the external ear with a large loose gauze dressing. No effort should be made to stop this bleeding. The auditory canal should not be explored mechanically, cleaned or irrigated. Neither cotton nor gauze should be introduced into the canal.

Shock is rarely the result of craniocerebral injury. Its presence usually indicates bleeding or trauma in other parts of the body. In these cases the head should not be placed lower than the trunk and the extremities since this position will aggravate intracranial bleeding. Otherwise shock associated with craniocerebral injuries should be treated without regard to the brain injury. Blood and plasma should be given as needed until the blood pressure levels approximate normal.

The unconscious patient should not be transported lying upon his back. In this position he may aspirate mucus and vomitus into his lungs and may have his airway obstructed by the tongue. He should be horizontal lying on his side, his body rotated well forward, his upper thigh flexed on the pelvis to hold him, his head resting on a firm pillow or folded blanket and turned toward the ground. This position will prevent the tongue

¹There are reports that rupture has occurred in the nasal cavity and in the large intestine by the use of sulfanilamide powder. The use of sulfanilamide powder has not confirmed these observations.

from falling back and interfering with respiratory exchange. It will also prevent aspiration of mucus and vomitus and will greatly reduce the hazard of aspiration pneumonia. In compound wounds the patient as a rule should lie only upon the uninjured side of the head. Conscious patients may have the head and shoulders elevated.

Morphine and other opium derivatives are contraindicated in cases of severe craniocerebral injury because of their strong depressant action on the respiratory center of the brain. The soporifics such as chloral hydrate, paraldehyde, and amylal are contraindicated because their use masks the significant changes in the patient's state of consciousness which are of prime importance in determining the presence of intracranial bleeding and the indications for operation. Fortunately pain is rarely a serious problem in craniocerebral injuries, closed or open, unless they are complicated by serious injuries to other parts of the body. When wounds of the thorax, abdomen, or extremities do cause great pain the first considerations should always be to relieve the pain but to use the smallest amount of morphine which will effectively accomplish this.

Restlessness presents serious problems in the care of craniocerebral injuries, especially during transportation, and if violent may result in serious harm to the patient. Sodium luminal, 3 to 5 grains (0.2 to 0.3 gm.) given hypodermically is the best drug to allay restlessness in that it will quiet the patient without depressing the respiratory center or greatly disturbing his state of consciousness. Sodium bromide or the triple bromides, 15 to 30 grains (1 to 2 gm.) by mouth or 45 to 60 grains (3 to 4 gm.) per rectum are also of value. If neither of these drugs is available, morphine may be given in small doses, $\frac{1}{8}$ to $\frac{1}{6}$ grain (0.005 to 0.010 gm.) and repeated after 30 minutes if necessary, provided the respiratory rate remains above 16 per minute.

One thousand to 1500 cubic centimeters of fluid each 24 hours should be given to all patients and if the patient is unconscious or is vomiting this should be given either by means of the rectal drip or by slow intravenous administration.

The first doctor to treat the patient with a serious craniocerebral injury should record the following facts without fail: (1) time of injury, as nearly as can be determined; (2) state of consciousness—is the patient rational or is he less confused, drowsy, stuporous, or comatose; (3) paralysis—does the patient move both arms and both legs voluntarily or in response to painful stimuli; (4) aphasia—does the patient talk or is he conscious but unable to talk; (5) pulse rate counted for half a minute; (6) respiratory rate counted for a full minute; (7) blood pressure.

Transportation to a hospital where definitive neurosurgical care can be given the patient should be initiated as early as possible. With sulfonamide therapy, a primary closure of craniocerebral wounds can be carried out safely as late as 48 to 72 hours after injury. Air transport below 3000 feet altitude is perfectly safe. These patients tolerate transportation very well, particularly before a definitive operation has been performed. It is more important that definitive care be given by a well-qualified and experienced neurological surgeon under favorable conditions than that it be given early.

Under conditions of warfare, it is usually best, even though this procedure requires 24 to 48 hours of travel, to evacuate craniocerebral injuries directly to an evacuation or general hospital located at a safe distance from the combat area where there are highly trained surgical and nursing personnel, where x-ray and operating room facilities are superior and where patients can be held 7 to 10 days after operation before they are again moved.

DEFINITIVE TREATMENT

The term "concussion of the brain" here used in a broad sense to designate the entire complex of all defined and incompletely understood pathological processes other than gross hemorrhage which contribute to or are associated with disturbances of consciousness following cranial trauma, including so-called axonal disruption, edema of the brain and cerebrospinal fluid hydrops. The pathological and clinical manifestations of concussion appear immediately after injury and almost always become maximum within the first few

hours. Patients who make a satisfactory adjustment during this initial period usually survive.

Generally accepted and well authenticated specific treatment for cerebral concussion does not exist. Surgical decompression is ineffective and often harmful and should not be performed. Lumbar puncture for therapeutic purposes is of questionable value but the cautious removal of 1 to 2 cubic centimeters of spinal fluid for diagnostic purposes is permissible. Intravenous hypertonic glucose or sucrose solution (100 cubic centimeters of 50 per cent glucose or 200 cubic centimeters of 50 per cent sucrose) has only a temporary effect and some undesirable side effects. Frequently repeated administration is contraindicated because of possible renal damage. Magnesium sulfate (25 per cent solution 150 to 200 cubic centimeters) given by rectum is an effective means of combating concussion in many instances but it is an expensive procedure both in linen and labor and its general use is not encouraged.

Supportive treatment is very important. If this is adequate the great majority of patients suffering from posttraumatic cerebral concussion uncomplicated by gross hemorrhage will survive. Fluids must be given to meet the basic metabolic requirements in all patients with craniocerebral injuries. One thousand cubic centimeters per day may be regarded as the absolute minimum and 1500 cubic centimeters per day as the desirable average. During hot weather or periods of hyperpyrexia the amounts should be increased to 2500 to 3000 cubic centimeters. Fluids should never be put into the mouth of unconscious or stuporous patients but should be introduced by rectal instillations, hypodermoclysis or very slowly into a vein. Not more than 1000 cubic centimeters of the fluids given intravenously during a single 4 hour period should be in the form of physiological saline solution. When intravenous fluids are given in excess of this amount they should consist of 5 per cent glucose in distilled water.

Nutrition must be sustained. During the first 48 to 72 hours after the injury, however, the patient will need to be given only fluids (1500 to 2000 cubic centimeters) and glucose

(80 to 100 grams). After 72 hours the patient will need in addition to fluids and glucose 60 to 80 grams of protein daily and sufficient fats to make up his caloric requirements. The fat requirement may be obtained temporarily in whole or in part from the fats of the patient's own body but the proteins must be supplied to the patient most conveniently in the form of egg albumin given by the stomach tube. In the unconscious or the stuporous patient feedings must be given by the stomach tube because attempts to feed this type of patient by placing food in the mouth are frequently followed by aspiration and pneumonia.

The prevention of aspiration pneumonia in the unconscious patient depends largely upon his position in bed. He should be placed on a firm flat bed preferably a fracture bed and supplied with a hard pillow. He should never lie on his back but rather on his side with the upper leg flexed, the body rotated well forward, the face down and the jaw and tongue dependent. In this position all mucus from the uppermost lung and bronchus, the trachea, the pharynx and the mouth will drain freely out and the tongue will not interfere with the airway. Unconscious patients should be turned from one side to the other every 4 hours at least and preferably oftener day and night.

The prevention of pressure sores of the skin and subcutaneous tissue will also be greatly aided by turning the patient frequently. In each position bony prominences must be protected from direct pressure of the bed or from other extremities. Tissues which have borne the weight of the body should be gently massaged with a well greased hand after each turning to restore the circulation more fully. The patient should be placed on an air mattress whenever one is available.

Intracranial Hemorrhage. Intracranial hemorrhage as a complication of closed craniocerebral injuries should be suspected in every patient who continues to get progressively worse following a blow to the head. It may be epidural, subdural, intracortical or intracerebral in location.

Epidural hemorrhage should be suspected with fractures of the vault. The bleeding is

arterial from torn branches of the middle meningeal artery and hence is apt to be rapid. This requires early recognition and treatment. A negative exploration is better than one too late. Neurological signs may be generalized contralateral or ipsilateral. Hence bilateral exploration is usually indicated. The site of election for exploratory trephination is just above the middle of the zygoma exposing the main trunk of the middle meningeal artery. If the artery is torn close to the foramen spinosum it may be necessary to plug that foramen with bone wax and the surgeon should be prepared to do this. Considerable blood may be lost before the bleeding point is controlled hence a donor should be present if possible. Small exploratory incisions may be made in the dura mater but it should not be opened widely at this time because rupture of the edematous cortex may result. Drainage down to the dura mater for a period of 4 hours may be useful.

Subdural hemorrhage is usually venous and occurs from torn cortical or subcortical veins. It rarely is under sufficient pressure to cause death and it usually stops spontaneously. Hence early evacuation is not so necessary as it is with epidural (arterial) bleeding it may often be delayed profitably until cerebral edema has subsided. Since the site of bleeding in young adults is usually the anterior pole of the temporal lobe exploration of the floor of the middle fossa is indicated and this is best exposed through a small osteoplastic flap after the period of acute edema of the brain has subsided that is 5 to 10 days after injury.

A chronic subdural hematoma should be suspected in every patient with a head injury when satisfactory initial progress becomes arrested or whose condition actually deteriorates. These clinical changes may manifest themselves 2 to 6 weeks after the injury occasionally later. The symptoms and signs are usually vague and often fluctuate from day to day or hour to hour. Under such circumstances bilateral exploratory trephination should be performed and the liquefied clot evacuated. Occasionally an osteoplastic flap is necessary if the clot has organized.

Intracortical hemorrhage if arterial is apt

to dissect into the ventricles and be rapidly fatal. If venous it tends to form large subcortical clots and then to stop spontaneously. These occur in the temporal lobes in 90 per cent of the cases equally on the right and left sides and almost as often *contre coup* as on the side of the blow. These venous clots are rarely fatal. They are characterized clinically by preponderance of the focal signs over those of general intracranial pressure the exact reverse of the clinical picture produced by surface clots. They are frequently associated with a subdural clot of moderate size. The presence of subcortical clots may be determined by pneumoventriculography or at operation by means of exploratory puncture or incision into the temporal lobe. Prognosis for the recovery of function after evacuation is favorable even after many weeks have elapsed.

Intracisternal hemorrhage is frequently associated with fractures at the base of the skull. Bleeding is usually from a tear in one of the large communicating veins leading from the cortex into a dural sinus and takes place directly into one of the subarachnoid cisternae. Since this is venous bleeding it is not under great pressure. However fatal results from this type of bleeding are frequent and are due to the fact that the large number of red blood corpuscles in the spinal fluid tend to block the channels over the cerebral hemispheres from which the cerebrospinal fluid is absorbed. The result is an acute hydrocephalus similar in character to the so called communicating type seen after meningitis in which postinflammatory adhesions of the subarachnoid spaces similarly interfere with the normal absorption of spinal fluid. Pressure signs usually do not appear critical until 1 to 24 hours after injury. Bleeding from the sinuses may be lessened by elevating the patient's head and shoulders. Spinal puncture is ineffectual in recovering the offending blood corpuscles at the point of actual obstruction over the surface of the cerebral hemisphere and possibly encourages fresh bleeding by temporarily lowering the pressure applied against the bleeding point. There is no accepted surgical measure to be taken against this type of intracranial bleeding and the prognosis has been

considered largely inherent in the injury itself. It may be that temporary drainage of one or both lateral ventricles by means of small catheters introduced through trephine openings may prove of value. General supportive measures similar to those outlined under the treatment for cerebral concussion are indicated.

Physical and mental rehabilitation of patients who have received a craniocerebral injury requires good judgment and skill. The patient must be encouraged in every way to think that the injury has been only a slight one. Terms like concussion of the brain and compound fractures of the skull must be absolutely forbidden and in the presence of the patient such simple terms as bump on the head and cut on the head substituted. Lumbar punctures in conscious patients are usually unnecessary and are particularly to be avoided. They add little useful knowledge, have little therapeutic value and leave a deep and bad psychological scar. An arbitrary period of bed rest for 2 to 3 weeks as was formerly practiced is no longer approved. Instead as soon as the patient feels able to sit up or go to the lavatory or to have his meals he should be allowed to do so. He should be encouraged to participate in the care of his room and his own person. Physical therapy including passive motion, baking, massage and electrical stimulation should be directed to paralyzed limbs.

Wounds of the scalp. Every wound of the scalp no matter how small may be a penetrating wound of the skull with injury to the brain. Therefore x-ray pictures of the skull should be taken in every case of craniocerebral injury before definitive treatment is begun to establish the presence or absence of concealed fractures, undriven fragments of bone or retained missiles.

Primary closure of wounds should be attempted in every possible case. Each wound of the scalp may be needed later as a portal of entry into the intracranial cavity in search of intracranial bleeding. Primary closure may be properly attempted as late as 48 hours following the injury in wounds which have not received any emergency treatment with the sulfonamides provided careful débridement

is carried out and vigorous systemic sulfonamide therapy is instituted after the operation. Wounds which have received preliminary treatment with the sulfonamides may be closed as late as 72 hours or even 96 hours after the injury. Standard neurosurgical procedures should be followed with conservative débridement and meticulous approximation of the skin edges. Sulfanilamide powder may be lightly dusted into the wounds before closure. There is however a general and growing conviction that with adequate systemic chemotherapy the local administration of sulfanilamide powder is unnecessary and even undesirable.

Drainage should be employed rarely with wounds of the scalp and only for the purpose of relieving tension by evacuating fresh blood. Drains do not prevent infection; they frequently introduce it. When drains are used in noninfected wounds of the scalp they should be led out through stab wounds and should be removed not later than 24 hours after the operation.

Fractures of the skull. Simple linear fractures of the skull are of little consequence in themselves apart from the concomitant injury to the intracranial contents. They are however frequently associated with intracranial hemorrhage, those of the vault with epidural bleeding from a torn meningeal artery and those at the base with bleeding into the basilar cisternae from large veins or venous sinuses.

Compound linear fractures are important because they afford a portal of entry for infections into the intracranial cavity. This is especially true of fractures compounded through the cribriform plate, the accessory air sinuses or through the external auditory canal. Hence it is important to institute early and vigorous chemotherapy in all such cases. Bleeding from the ear indicates a compound fracture into the external auditory canal. Gross clots plugging the peripheral portion of the canal may be removed gently but no attempt should be made to explore the canal, clean it or even irrigate it. No cotton or gauze should be placed in the canal. The external ear should be covered with a flat sterile gauze dressing.

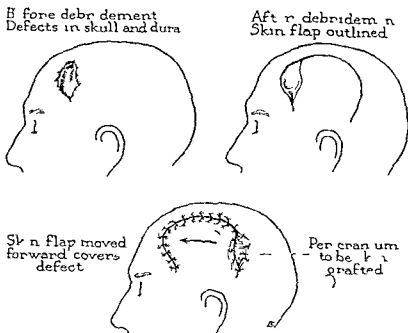


Fig 1 Method of closing scalp by sliding flap method

Simple comminuted (depressed) fractures should be elevated early to avoid the effects of both general and local pressure upon the brain. Compound comminuted (depressed) fractures are frequently accompanied by perforation of the dura mater and laceration of the brain. X-ray studies are mandatory before definitive care is instituted. In treating these cases scalp, skull and dura should be debrided carefully, foreign matter should be picked out, devitalized brain removed with the sucker, hemorrhage arrested, the dura mater repaired and the scalp closed. Drains should as a rule not be necessary, but if used they should be brought out through separate stab wounds and removed altogether during the first 24 hours. In cases in which sulfonamides have not been administered at all prior to operation, primary closure may be attempted at any time during the first 36 hours after the injury, provided that maximum systemic sulfonamide therapy be carried out postoperatively. In those cases in which sulfanilamide powder has been introduced into the wound as part of emergency treatment soon after the injury, primary closure may properly be undertaken as late as 7 hours after

the receipt of the injury in the majority of instances.

Closure of the dura mater and scalp is to be sought in all cases. Large dural defects should be closed by split dural flaps or with free transplants from the temporal fascia, the pericranium or the fascia lata. Penicillin (10,000 units) if available should be introduced inside the dura upon the underlying and adjacent brain.

The closure of wound of the scalp can be accomplished in most instances after extensive mobilization of the scalp between the galea and pericranium. If however this does not suffice then the best way to close a defect in the scalp usually is by means of a sliding flap of scalp having the shape of an elongated horseshoe (Fig 1). The flap should not include the pericranium. In outlining and cutting such a flap it is important to make it considerably oversized in both transverse and longitudinal directions because of the complete inelasticity of the tissue. If great care is not exercised in doing this the edges intended to be apposed will not meet. The base of the flap should be wide to insure adequate blood supply to its periphery. Edges of the flap not

suture 1 to the scalp should be loosely sutured to the pericranium. Drains usually need not and should not be used. The pericranial surface left exposed after moving the flap should be covered immediately by a Thiersch graft or a skin graft of intermediate thickness. Such grafts are successful in a very high percentage of cases. In the rare cases in which they do not succeed, the exposed bone will be covered quickly with granulations if numerous small drill holes are made through the outer table to the diploic spaces. These granulations can subsequently be covered with pinch grafts or other types of skin grafts. Sulfanilamide powder should not be used locally, but vigorous systemic sulfonamide therapy instituted.

Compound comminuted fractures into the accessory nasal sinuses present troublesome problems. No rule can be laid down for treatment which will meet the specific needs of every case. In general, however, the principle should be to repair the scalp and dura mater exactly as in compound comminuted fractures in other parts of the cranial vault and to do as little as possible to the sinus. In dealing with the sinus it is almost axiomatic that the less the surgery the less the trouble. The contour of the sinus should be re-established as far as possible by gentle manipulation with the smooth rounded end of a hemostat or any other similar instrument. Comminuted portions of the bony walls should be preserved wherever possible and only fragments of bone entirely detached from all soft tissues should be discarded. The mucous membrane lining the sinus should be carefully conserved even though badly torn because of the great power of regeneration possessed by this membrane and its strong tendency to re-form a functioning air sinus. The frontal sinuses should not as a rule be touched. Drains should not be used. The danger of serious intracranial infection is generally less than might reasonably be expected if sulfonamide therapy be aggressively employed. The administration of sulfanilamide powder locally in small amounts is recommended in these cases in addition to the systemic administration of the sulfonamides.

Repair of defects of the frontal bone resulting from compound comminuted fractures in

this region either with tantalum or by bone grafts should not be attempted at the time the acute injury is treated.

Rhinorrhea of cerebrospinal fluid persisting for longer than 5 days should be treated by intracranial closure of the internal orifice of the fistula by fascia transplant as soon as a craniotomy may safely be performed. Sulfadiazine should be administered systemically. Maximum chemotherapy should be instituted early and maintained for 10 to 14 days after operation.

Penetrating wounds of the brain. The basic principles outlined for the treatment of wounds of the scalp, compound fractures of the skull, cerebral edema, and intracranial hemorrhage apply equally to the treatment of penetrating wounds of the brain. Hemorrhage and shock should be treated according to established principles. Roentgenograms of the skull should be studied before definitive treatment is undertaken.

Penetrating wounds when received for definitive treatment may be either fresh or old. The fresh cases include those not having received preliminary local or systemic treatment with sulfonamides but which present themselves for definitive treatment not later than 36 hours after the wound was received and without signs of active sepsis in the wound at that time, also cases which have received adequate emergency sulfonamide therapy at the time of injury or soon after presenting for definitive treatment not later than 72 hours after the injury was received without signs of active sepsis in the wound at that time.

Early penetrating wounds of the brain should have definitive surgery at the earliest possible moment. The entire head should be shaved immediately before operation. A large area of scalp should be cleansed and so draped that any plastic procedure which might be necessary to close the wound such as a large sliding skin flap may be performed. Debridement of the skin should be conservative. All loose fragments of bone should be discarded. The openings in the skull and dura mater should be enlarged. Devitalized cortex should be excised. The tracts of all large missiles within the brain then should be thoroughly

explored. Dirt hair particles of clothing fragments of bone old blood clots and devitalized brain must be cleaned out after which the tract should be thoroughly irrigated with physiological saline solution. Damaged and contaminated brain lining these tracts may be removed with a blunt curette or a sucker. Penicillin (10 000 units) should then be introduced into the full length of the tract. The opening in the dura mater should be closed tightly by the use if necessary of free grafts of the patient's temporal fascia pericranium or fascia lata held in place with fine silk sutures. Primary suture of the skin must be accomplished over defects in bone and dura mater. If there has been loss of tissue of the scalp some standard form of plastic repair of the defect must be employed such as a sliding skin flap.

Penetrating wounds of the brain involving the frontal and ethmoid sinuses the anterior nares and the orbital fossae demand special consideration. Principles governing the care of compound comminuted fractures of this region already discussed naturally apply to these wounds. However in penetrating wound closure of the opening through the dura acquires maximum importance and is really the crux of the successful treatment of these cases. In order to close this dural defect it will usually be necessary to provide an opening through the frontal bone on the affected side large enough to expose the anterior pole of the frontal lobe and the floor of the frontal fossa. If the original opening in the skull made by the missile be high in the frontal region extending well above the supra-orbital ridge this original opening may simply be enlarged with rongeurs. If on the other hand the tract of the missile has involved only the bony structures of the floor of the anterior fossa and not the anterior wall then surgical exposure of the fossa should be through a small osteoplastic flap. The dura when exposed should be opened sufficiently to admit exploration of the anterior pole of the frontal lobe and the floor of the frontal fossa including the portal of entry of the missile. Bone dura and brain about this opening should be debrided and a careful toilette of the free space between brain and dura made. Un-

fortunately the direction of the tract of the missile is usually such that its exploration is impossible without making fresh deep incisions through the brain a measure which is rarely justifiable. A free graft of temporal fascia pericranium or fascia lata should be laid over the defect in the bone made by the missile. This graft should be large enough to allow generous overlap at all margins. Only rarely will it be possible to suture the graft in place effectively. However this is not necessary for if the graft be large enough and not too much brain tissue has been lost as a result of the injury or by débridement the weight of the released frontal lobe and its slight tendency to expand after the retraction will hold the graft securely in place until fibrous union between it dura and exposed bone takes place. The surgical incision made through the dura should then be closed with fine silk sutures. Penicillin (10 000 units in 2-3 c.c.) should be introduced into the subdural space. The local use of sulfanilamide in the region of the graft is undesirable since it will attract fluids which may loosen the graft. The galea and the scalp should be closed with interrupted fine silk sutures without drainage. Maximum doses of sulfadiazine and penicillin should be given systemically for 10 to 14 days after the operation. Great care should be taken to prevent upper respiratory tract complications during the postoperative course since violent sneezing or coughing might dislodge the graft.

The removal of bony fragments from the brain is of the utmost importance. Experience has shown that cerebral abscesses develop around 50 per cent of bone fragments not removed. The smaller metallic fragments constitute no such danger and attempts to remove them should not be made at the risk of damaging healthy cerebral tissue. It is desirable however to remove the larger missiles when this is surgically feasible.

Cerebral abscess should be suspected whenever normal recovery from a penetrating wound of the head is arrested. Pneumoencephalography may properly be performed under such circumstances. If an abscess be present it should be treated by any one of the standard methods.

Late penetrating wounds of the brain are those not included in the above categories. The majority will be septic. In addition to cellulitis of the scalp many will already have developed osteomyelitis cerebritis meningitis cerebral abscess or cerebral herniations and fungi. Treatment of these conditions will of necessity be determined by specific indications in the individual cases hence procedures will vary with each patient and for each complication. Cellulitis of the scalp should be treated with chemotherapy and in accordance with standard surgical principles. Osteomyelitis of the skull requires free dependent drainage of the bone and the adjacent covering soft tissues with removal of sequestra as they form in addition to intensive chemotherapy. Radical bone resection of large portions of the skull usually gives disappointing results and is not advocated. Preliminary studies with penicillin indicate that it may be particularly effective in the treatment of osteomyelitis. Sulfonamide therapy should be used actively. Meningitis and cerebritis can be treated only by the sulfonamides and penicillin but respond favorably in a majority of cases. Cerebral abscesses may be treated by whichever one of the commonly accepted methods the neurological surgeon prefers. Abscesses secondary to penetrating wounds are usually due to retained bone fragments or other foreign matter along the tract of the missile. Exploration of the tract with removal of bone fragments and foreign material followed by a short period of drainage is the method of choice and offers a good prognosis for rapid healing.

Pathology and treatment of cerebral herniation. Cerebral herniation and fungus formation occur whenever there is a defect in the dura mater bone and skin overlying the brain and is due to the fact that no structure opposes the intracranial pressure which tends to push the brain out through the defect. Cerebral herniations invariably become infected and there is usually some necrosis of superficial tissue due to interference with the blood supply entering the herniation. A cerebral herniation which thus becomes infected and partially necrotic is designated as a cerebral fungus. If the intracranial pressure remains

normal the outward extrusion of the herniation or fungus as a rule gradually comes to rest the necrotic tissue is removed by natural processes and the surface of the brain becomes covered with granulation tissue and eventually scar tissue. This scar tissue in time contracts with sufficient force to counteract the expanding action of the intracranial pressure and will in favorable cases finally reduce the hernia completely to the general contour of the cranium. It then remains only for the surface of the scar tissue to become epithelialized which may take place spontaneously from the edges of normal skin or may have to be accomplished by grafting.

The primary object in the treatment of cerebral herniation is to keep to a minimum the protrusion of cortical tissue through the defect in the skull. In attempting to achieve this end effort should be directed primarily at minimizing expanding pressure within the skull rather than by attempting to hold the brain within the cranial cavity by applying pressure against it from without by means of pressure dressings. This latter procedure is almost always ineffective against continuous and elevated intracranial pressure and in addition causes pressure necrosis of the herniating brain and greatly increases the amount of local sepsis in the brain tissue.

Measures for reducing intracranial tension should include maintaining the patient in a sitting posture in bed whenever possible. Spinal drainage with removal of 30 to 50 cubic centimeters of spinal fluid should be performed twice daily for 4 weeks until necrotic and infected tissue has been removed from the surface of the herniation and the exposed brain is covered with a clean layer of granulation tissue. Great care must be exercised to keep the patient from acquiring upper respiratory infections which will force him to cough and thus violently force protrusion of a cerebral hernia. Also similar precautions must be taken against nausea and vomiting. The bowels must be kept open with the aid of laxatives once straining at stool and even the administration of enemas greatly increases intracranial pressure.

Local sepsis must be aggressively combated. Wet compresses Dakin's solution or sulfona-

mide dressings should be applied to the surface of the herniation or fungus until all necrotic tissue has been removed and exposed brain has been covered by healthy granulation tissue. Thereafter the granulating surface should be treated as any other granulating surface, the essential principle being the use of a lubricated dressing which will not interfere with the ingrowth of epithelium over the margins of the wound. Superficial marginal abscesses must be constantly looked for and effectively drained when present. These are apt to occur beneath the overhanging edges of scalp bone or dura mater. In the very beginning it is important to have the opening in the bone larger than the opening in the dura mater and the opening in the scalp larger than the opening in the bone in order to prevent abscess pocketing by overhanging tissue.

The herniation must be protected from direct pressure by a firm ring of cotton or gauze. Direct pressure will produce necrosis and an increase of local infection. As superficial tissue is lost through necrosis and sepsis, the lateral wall of the ventricle is approached and the danger of meningitis and rupture of the ventricle with leakage of spinal fluid becomes imminent.

Persistently progressive herniation after 3 to 4 weeks of proper treatment or excessively rapid herniation indicates pathologically elevated intracranial pressure. This is usually due to the presence of an intracranial abscess which may be extradural, subdural or intracerebral. X-ray evidence of retained bone fragments may reveal the site of the abscess. If the plain X-ray films offer no help, pneumo-ventriculography is indicated.

A new alternate method for the treatment of cerebral herniation has recently been advocated. This consists of forcibly reducing the herniation and holding it in place within the cranial cavity by means of a perforated tantalum plate which is securely fixed into the defect of the skull. The irritating effects produced by gauze or other types of restraining dressings are greatly minimized with such a tantalum dressing and the vicious pathological cycle resulting from progressive or continuous herniation is avoided. The outer surface of the tantalum plate is in turn covered

by a sliding flap of scalp. The complications from infection which might be reasonably expected are reported to be infrequent. Despite obvious objections this procedure has much in principle to recommend it. It is too soon however to make a final appraisal of the method at this time although reports to date make further application in selected cases justifiable.

SPINAL INJURIES

IMMEDIATE TREATMENT

Injuries of the cervical spine resulting from indirect trauma are almost invariably forward dislocations of the head and upper part of the cervical spine upon the lower part with a pathological anterior angulation at the level of the lesion. In the production of this injury one or more of the articulating facets of the involved vertebrae may be chipped off but these small fractures must always be regarded as secondary to the dislocations. Determination of the exact level of the fracture-dislocation is unimportant for the emergency treatment.

The diagnosis of fracture-dislocation of the cervical spine should always be suspected whenever an injured man complains of severe pain in his neck. The diagnosis should be made definitely whenever an injured man is unable voluntarily to move either his arm or legs.

The most important principle in the emergency treatment of fracture-dislocations of the spine is to do nothing which will increase the bony deformity. Do not move the patient unless absolutely necessary for each new movement may cause bone to cut into the spinal cord. Do not raise the patient's head to give him a drink or a cigarette. Do not put a rolled blanket or pillow beneath the head. Do not lift the patient off the ground unless he is on a litter or other rigid support. Reduction should not be attempted. Plaster casts should not be applied.

The patient with a fracture-dislocation of the cervical spine is in the optimum position when he is lying on his back with a folded blanket 3 to 4 inches thick beneath his shoulders with his head below the level of his shoulders and his neck in slight dorsiflexion.

(hyperextension) Folded blankets should be secured at both sides of the head to prevent lateral movement. A patient with a fracture dislocation of the cervical spine should not lie face down with his neck twisted nor upon his side with his neck flexed laterally. Care should be taken that clothing and blankets are smooth beneath the patient. Pockets should be emptied.

Three persons are needed to turn properly a patient with a fracture dislocation of the neck onto his back from some less favorable position. The senior of the three men should grasp the chin and occiput and exert steady traction in the line of the long axis of the body. The second man should grasp the ankles and exert equal countertraction along the axis. The third man should then kneel beside the patient, reach across his body and grasp the patient's clothing near the shoulder and near the hip joint with his two hands. He should then gently rotate the patient toward himself while the men at the head and feet exert their traction. The head, neck, body and legs should all be made to move simultaneously. A folded blanket 3 to 4 inches thick should be so placed on the ground or the litter that the patient's shoulders finally come to rest on top of it when rotation has been completed. This position will allow the head to hang down slightly and permit a moderate dorsiflexion (hyperextension) of the cervical spine—a position which tends to correct the deformity caused by the fracture dislocation.

A patient with a fracture dislocation of the cervical spine should never be lifted from the ground on to the litter; he should be rotated or pulled on to it. In transferring a patient from the ground to the litter, the latter should be placed beside the patient. If he be lying face down upon the ground, he may be rotated on to the litter in the manner described in the preceding paragraph coming to rest on his back with the folded blanket beneath his shoulders. If the patient be lying face upward on the ground, the three men should take the same positions as for turning him, with the exception that the man at the side should grasp the patient's clothing on the side nearest to himself. The three men then gently slide the patient from the ground on to the litter

without lifting him; the two men at the head and feet meanwhile maintaining a strong longitudinal traction.

The prevention of pressure sores is a major problem in all paralyzed patients. Efforts should be made from the beginning to keep pressure off the sacrum and the heels. Whenever possible, the paralyzed patient should be placed upon an air or other soft mattress during transportation.

Urinary retention is common with spinal cord injuries. Extreme distention of the bladder must be avoided. An indwelling catheter should therefore be introduced before distention of the bladder occurs and especially before transportation of the patient to a distant point is initiated. The catheter must never be clamped. If cystitis should develop it will not become serious as long as drainage is free and it can be readily cleared up with the aid of tidal drainage and sulfonamide therapy at the hospital to which the patient is taken. Cystostomy should not be performed.

Morphine should not be given to patients who have received injuries to the cervical spinal column.

All patients with fracture-dislocation of the cervical spine should be transferred as early as possible to a hospital where definitive neurosurgical treatment can be given.

The common lesion of the lumbar spinal column is a compression fracture of the body of the first lumbar or adjacent vertebrae. This results in an anterior angulation of the spinal column which causes compression of the spinal cord. Dislocation between the vertebrae is uncommon at this level. The diagnosis should be suspected whenever an injured man complains of a severe pain in his lumbar spine and should be made definitely whenever such a man is unable voluntarily to move his legs.

The fundamental principles for the emergency treatment of compression fractures of the lumbar spine are essentially the same as for fractures of the cervical spine. The patient should not be moved unless it is absolutely necessary. He should not be picked up and carried from one place to another unless he has first been placed upon a litter or other rigid structure. There are two acceptable positions for a patient with a compression

fracture of the body of one of the lumbar vertebrae. If an air mattress is available the patient should be placed upon it lying upon his back with 2 or 3 folded blankets underneath the air mattress at the site of the fracture so placed as to produce hyperextension of the spine. If an air mattress is not available then the best position for transport is the face down position. This position automatically prevents further anterior flexion of the lumbar spine. It also prevents the formation of pressure sores at the point of angulation of the spine and over the sacrum. However in this position the toes, knees and genitals must be protected against pressure. No other attempt at correction of the bony deformity should be made at this time. Plaster casts should not be applied to any patient with a spinal cord injury having anesthetic skin.

The principles involved in turning a patient with a compression fracture of the lumbar spine are similar to those for turning a patient with a fractured cervical spine except that in fractures of the lumbar spine traction by the man at the head of the patient may be applied under the armpits. In transferring the patient from the ground to the stretcher the same principles apply as in the case of a patient who has a fracture dislocation of the neck.

The principles which underlie the prevention of pressure sores and the care of the bladder in patients with a compression fracture of the lumbar spine are the same as those which apply to the patient with a fracture dislocation of the cervical spine. Morphine may be given as necessary to control pain and the patient should be transported as early as possible to a hospital where definitive neurosurgical treatment can be given.

Compound injuries of the spinal column are usually the result of gunshot wound. No attempt at definitive treatment should be made at the site of the accident. Sulfanilamide powder should be dusted lightly into the wound. Large protective dressings should be securely applied. In all other respects the patient should be treated and transported in accordance with the principles outlined for the care of closed spinal injuries. Since penetrating wounds of the spine are frequently associated

with wounds of the lungs or abdominal viscera such complications should be looked for and treated appropriately.

DEFINITIVE TREATMENT

Quantitative relationship between injury to bone and injury to spinal cord does not exist. The differential diagnosis between anatomical severance of the cord and a simple and temporary physiological interruption of function is often difficult or impossible to make clinically during the early posttraumatic period. Hence the dictum that all cases of paralysis following spinal injury must be treated as though they were suffering from a recoverable lesion until proved otherwise.

The neurological signs present after spinal injury may be due to any one or a combination of the following pathological factors: (a) edema of the cord, (b) hemorrhage into the cord, (c) compression of the cord by displaced vertebrae and (d) anatomical section of the spinal cord.

Edema of the spinal cord occurs with every serious injury of the spine. It develops rapidly and is often extreme. Within an hour after injury the spinal cord may be two or three times the normal diameter so that it fills the dural envelope tightly. This is the most common cause of manometric block (positive Queckenstedt sign) during the first few days after injury. If the dura mater is opened at this time spontaneous rupture of the spinal cord with anatomical loss of continuity may result. A manometric block therefore should not be considered as an indication for laminectomy during the acute posttraumatic period. The clinical signs produced by severe edema of the cord are indistinguishable from those produced by transection of the cord during the first 4 to 48 hours after injury. They tend to improve after the 4th or 5th day and complete functional recovery from total paralysis may follow quickly.

Hemorrhage may occur into the extradural, subdural and subarachnoid spaces but in these sites it rarely causes compression of the cord or produces neurological signs of clinical significance. Hemorrhage into the cord itself is limited almost invariably to the central grey matter (hematomyelia). Here bleeding

may dissect its way up and down the grey matter for a number of segments. The clot thus formed never attains sufficient diameter to cause compression of the long tracts adjacent to it or to require decompressive measures. It produces its effects by disrupting neurones and reflex arcs at segmental levels producing motor effects of the lower motor neuron type i.e. flaccid paralysis muscle atrophy and hypotonic reflexes. After liquefaction and absorption of this clot some return of function may be expected in the affected reflex arcs. Surgical evacuation of these intra spinal blood clots produces irretrievable damage to segmental neurones and reflex arcs and this procedure therefore should not be performed.

Compression of the cord by displaced bone is a less frequent cause of persistent paralysis following spinal injury than is generally assumed to be true. This is because the bony neural canal is so much larger than the spinal cord that considerable encroachment upon the lumen of the canal may take place without serious pressure upon the cord. Notwithstanding this general anatomical fact however correction of bony malalignment and deformity following spinal injury is important and should be performed as soon as it can be properly done.

Typical skeletal deformities of the spine may follow either direct or indirect violence. Direct trauma to the spinal processes and laminae due to blows from the rear in which the laminae are fractured and driven into the bony canal is rare with the closed type of injury but common with gunshot wounds. When encountered immediate laminectomy with the removal of the offending bone is indicated. This is the only type of spinal injury which offers an absolute indication for an early laminectomy.

In direct trauma of the spine produces typical deformities. In the cervical spine there usually occurs a forward dislocation of the head and the upper portion of the cervical spine over the lower portion of the cervical spine. This may be unaccompanied by any fracture but it is usually accompanied by a fracture of one or more of the articulating facets of the affected vertebrae. It will

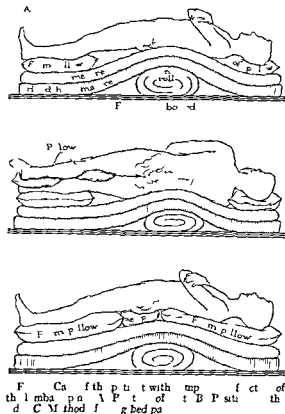
be borne in mind however that the essential lesion is usually that of a forward dislocation and that the fracture of the articulating processes is secondary. This typical injury is referred to as a fracture dislocation.

In the thoracic spine the plinting afforded by the thoracic cage is so great that fractures severe enough to produce neurological signs rarely occur unless the trauma has been of extreme violence as when for example a person falls from a great height or is thrown from a rapidly moving vehicle against a telegraph pole or tree. Under such circumstances ribs are usually broken destruction and malalignment of the spinal column are tremendous and the spinal cord is usually transected.

In the lumbar spine following sudden arrest of forward motion of the patient's body the strong articulations between the vertebrae hold fast but the bodies of the vertebrae give way. The resulting and typical lesion is a compression of the body of one or more of the lumbar vertebrae usually just below the thoracic cage. Dislocation between the vertebrae either forward or lateral is rare and acute forward angulation is the main deformity.

The treatment of bony deformities depends upon the nature and site of the injury. Depressed fractures of the laminae require immediate laminectomy and the elevation of depressed bone.

Fracture dislocation of the cervical spine is best corrected by closed traction methods. Laminectomy with open operative reduction is usually not only unnecessary but is strongly contraindicated and should not be employed. The best method of reduction is by skeletal traction applied with the skull tongs described by Crutchfield. Halter traction with straps applied around the occiput and beneath the chin is unsatisfactory because it is extremely uncomfortable it interferes with movements of the jaw in eating and talking and it tends to produce pressure sores beneath the chin and at the occiput. Furthermore considerably less traction may be applied by this method. The former practice of rapid reduction using traction of great force with the immediate application of a plaster cast extending over the occiput and chin down over the thorax is no longer justifiable with the



Compression fractures of the lumbar vertebrae do not require surgical procedures. Laminectomy is strongly contraindicated in most cases. These deformities are best corrected by closed methods of hyperextension. Fracture boards are first placed upon the bed to prevent sagging. Two or three blankets are then made into a roll the width of the bed and approximately 18 inches in diameter. This is placed across the bed on the fracture boards at the level of the spinal injury. A hard hair mattress is placed over the blanket roll and on top of this a softer mattress, preferably an air mattress, if one is obtainable. The curved surface of the uppermost mattress will then conform approximately to the normal lumbar curvature of the healthy spine. When the fracture bed has thus been set up, the patient is gently lifted on to it face up in such a position that the site of the injury lies above the blanket roll. The weight of the upper and lower parts of the body will then serve slowly to bring the kyphosed spine into a position of normal lumbar lordosis. This method of reduction is far more efficient and less traumatizing mentally and physically to the patient than is the older method of reduction by suspension upon a canvas hammock (Fig 2a).

newer methods now available. Frequent x-ray examination should be used to control the reduction of the fracture dislocation at all stages both early and late. Traction should be maintained until sufficient time has elapsed for firm fibrous union to be established between the injured vertebrae and this usually requires at least 6 weeks in severe injuries 12 weeks. Weight bearing should be deferred until repair of bone is well under way; patients therefore should remain in bed in a prone position for approximately 12 weeks after removal of traction. When the patient finally becomes ambulatory he should wear a plaster or a leather collar for 6 months or more.

Fractures of the thoracic spine with the usual gross misalignment of the vertebrae can not be satisfactorily corrected by any method open or closed. The spinal cord has usually been transected at the time of injury and prognosis for the recovery of spinal puncture is hopeless. Laminectomy is usually futile and hence contraindicated.

The bed care of patients with fractured spine is of prime importance. In order to change bed linen or to bathe these patients they may be turned on their side without risk of injury if the bed has been properly set up. The soft tissue between the hip, the pelvis and the lower edge of the thorax will conform very satisfactorily to the curvature of the bed as the patient is turned without permitting significant lateral misalignment of the spinal column. Moreover, the large intervertebral articulations at the level of the lesion are rarely damaged sufficiently to allow lateral misalignment (Fig 2b).

In using the bed pan the patient is rotated gently to one side. The bed pan is then placed in the center of the bed and firm pillows or folded blankets having the same thickness as the bed pan itself are placed on the bed above and below it. If these pillows or blankets have the correct thickness and firmness and are properly placed the original curvature of the top mattress is preserved (Fig 2c).

The patient is then slowly rotated on to his back so that his back and legs are supported at exactly the same level as the bed pan. In this way hyperextension of the spine is maintained. A bed pan should never be placed beneath a patient with a compression fracture of the lumbar vertebrae unless these precautions against inflexion are first taken. Another method of evacuating the bowels of a patient with a fractured spine is to place him upon one side and carry out colonic irrigation.

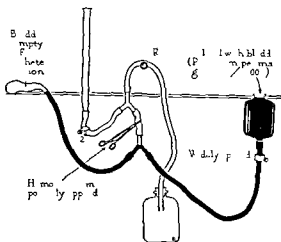
Prevention of hypostatic pneumonia is a major problem during the first days of treatment in all fractures of the spine. In fracture dislocation of the cervical spine specific injury often occurs to the 4th and 5th cervical segments from which the phrenic nerves innervating the diaphragm take origin. In addition to this the attendant edema of the cord tends to interfere with the passage of impulses from the respiratory center of the brain to the respiratory musculature of the thorax. For these two reasons respiratory movements are apt to be hallow. Coupled with this is the fact that the patient is lying on his back in which position it is difficult for him to clear his mouth and posterior pharynx of accumulated mucus. Should signs of impending pneumonia appear it is imperative that treatment of the pneumonia take precedence over treatment of the fracture for the reason that an accurate alignment of spine is of no value if the patient dies of pneumonia. Accordingly any patient threatened with or suffering from pneumonia must be turned from one side to the other every 2 to 3 hours day and night to permit free drainage of exudate and mucus from first one half and then the other half of the respiratory tree. All other supportive measures generally employed in the treatment of pneumonia should of course be utilized.

In compression fractures of the lumbar spine pneumonia is caused by a different mechanism. The continued hyperextension of the body causes the rectus muscles of the abdomen to pull upon the lower ribs. An acute traumatic peritonitis frequently develops at the point of attachment of the rectus muscles. This may be quite painful and cause involuntary splinting of the lower part of the thoracic cage. This limitation of respiratory

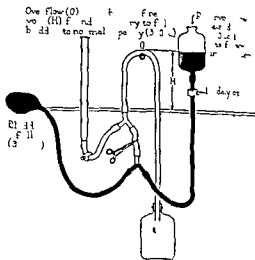
movements in the lower lobes of the lungs predisposes to the development of hypostatic pneumonia in much the same way that splinting of muscles after upper abdominal operations does. These patients must be given sufficient morphine during the first few days that they are lying in hyperextension to mask the pain due to the mechanism just described. If this be done promptly and adequately respiratory movements will be inhibited only slightly and the tendency to hypostatic pneumonia greatly reduced. Should pneumonia develop the same general principles regarding its treatment apply in the lumbar fracture as in the cervical fracture.

Abdominal distention may occur during the first few days after an injury of the lower thoracic spine due to interference with the autonomic nervous system. It should be dealt with vigorously along the same lines used in treating paralytic ileus following abdominal operations. Passage of a Miller Abbott tube into the upper alimentary tract is the best method. Eutressin (1 c.c. ampul) or prostigmine (1 c.c. ampul) may be given intramuscularly. Rectal tubes should be used. Enemas of soap suds or water and glycerine may be tried. Hot stupes to the abdominal wall are often effective. As a rule distention is rarely critical and is usually short lived.

All so called bed sores are pressure sores and are invariably the result of local ischemia caused by continued pressure upon soft tissues. It is no longer permissible to regard pressure sores as trophic disturbances. Prevention is the best treatment. This demands constant vigilance to prevent continuing pressure by a hard bed or by other parts of the body upon soft tissues overlying bony prominences. Wherever possible a paralyzed patient should be placed upon an air mattress. As a rule the patient may lie on his back on such a mattress indefinitely without developing pressure sores of the skin over the sacrum. Even with an air mattress however it is necessary to keep the heels off the mattress by placing a firm pillow or a folded blanket of sufficient thickness crosswise beneath the calves of the legs so that the heels do not touch the bed. Small pillows or cotton pads must also be placed between the knees and between



Fg 3



F 4

the ankles and to s. Finally the bed covers must be kept off the toes by means of a frame.

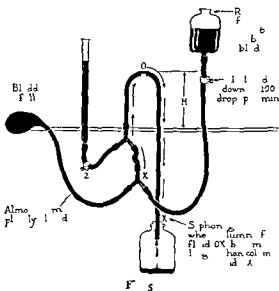
If an air mattress be not available prevention of pressure sores is very much more difficult. Under these circumstances air rings when available should be used to protect bony prominences. If these be not available the surgeon must rely upon frequent turning of the patient and the use of cotton pads at vulnerable points to prevent the development of pressure sores.

The treatment of existing pressure sores should follow the same basic surgical principles applying to the treatment of other wound containing infected and necrotic tissue. All devitalized skin fat and subcutaneous tissue must be excised immediately with scalpel or scissors. Wet saline compresses, Dakin's solution or moist sulfonamide dressings must be applied to the infected base until it is covered by healthy granulations. Skin grafts may be used to hasten healing.

Plaster casts should not be applied to the trunk and extremities of any patient with a spinal injury having anesthetic skin.

Care of the bladder is a major problem in every paralyzed patient. The purposes of treatment are twofold: (a) the prevention of serious sepsis of the urinary tract and (b) preservation of normal bladder capacity and musculature. The former is necessary for the preservation of life, but the latter is very important if the patient is to make a satisfactory social adjustment after his recovery from the acute phases of his injury. In an effort to attain the former objective the secondary objective should not be ignored.

Extreme distention of the bladder should be avoided at all times as a first principle. An indwelling catheter should therefore be introduced at the time emergency treatment is given before distention occurs and especially before the evacuation of the patient to distant



F 5

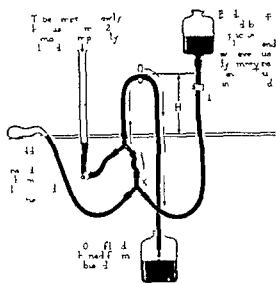


Fig 6

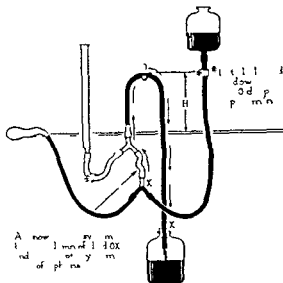


Fig 7

points is initiated. If cystitis develops it will not become serious provided drainage be free and the bladder mucous membrane has not been fissured or the muscular walls paralyzed by extreme distention. It can be readily cleared up with the aid of tidal drainage and sulfonamide therapy at the hospital to which the patient has been evacuated. The in lying catheter should be as large in caliber as the patient will readily tolerate.

Tidal drainage is considered the method of choice in the treatment of the paralyzed bladder and should be instituted as soon as the paralyzed patient is received in an established hospital. Should standard sets not be available at the time needed the neurosurgeon should improvise tidal drainage along accepted lines. There are several acceptable forms of tidal drainage; one is here shown for purposes of reference (Fig 3 to 8). It is important that the catheter and drainage tube should be brought out over the thigh rather than allowed to fall down between the thighs and lie along the bed. In this latter position an acute angulation of the urethra occurs at the level of the suspensory ligament which will contribute seriously toward the production of irritative urethritis. By bringing the tube laterally over the thigh this angulation with its resultant urethritis is prevented. The in lying catheter should be removed approximately

once a week. This should be done in the morning and a new catheter should not be replaced until late in the day. This allows 8 to 10 hours for voluntary micturition to occur if the bladder mechanism is ready to assume that function. If voluntary micturition does not occur the catheter should be replaced and tidal drainage continued for another week when the procedure outlined above should be repeated.

Voluntary control of the bladder often does not return until 6 or 12 weeks after injury.

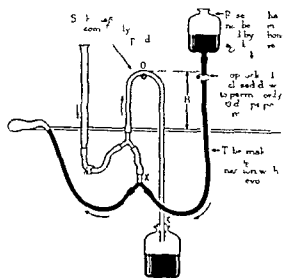


Fig 8

and tidal drainage should not be discontinued before that time without good and specific cause. Even in cases in which the spinal cord has been completely sectioned at the time of injury, an automatic type of bladder can usually be established after 8 to 12 weeks. After removal of the catheter in such a bladder there is no dribbling of urine and periodic voidings of 150 to 300 cubic centimeters of urine can be initiated voluntarily by abdominal straining or by sustained pressure applied manually to the abdominal wall over the bladder area by patient or attendant at periodic intervals.

Cystotomy should not be employed when tidal drainage by urethral catheter is available unless that method has been fully tried and proved unsatisfactory. The only absolute medical indication for cystotomy is a fulminating urinary infection which has not responded satisfactorily to tidal drainage. A high cystotomy is preferable to a low one. This procedure should be performed by a urologist if he is available.

Compound injuries of the spine usually result from gunshot wounds and often are associated with penetrating wounds of the thorax or abdomen. Early laminectomy with full exposure of the cord is usually indicated but must be regarded as secondary to the treatment of the thoracic or abdominal wound. Splinters of bone and metal should be removed from the canal when their presence threatens damage to the cord. Sulfonamide powder should not be directly introduced into the spinal fluid or onto the cord although the small amounts which may get there from other parts of the wound will cause no damage. Disinfection of the cerebrospinal fluid should depend upon a high blood level of sulfadiazine and with this drug the cerebrospinal fluid level is about half that of the blood level. The dura should be closed if possible to prevent spinal fluid leak. A free transplant of fascia may be used to accomplish this if necessary. Sulfanilamide powder should be lightly sprinkled about the exposed bone and throughout the muscular and fascial layers. These tissues and the skin should be closed without drainage otherwise a spinal fluid leak with formation of a fistula and with terminal meningitis is apt to occur.

Recovery of function in extremities and sphincters after severe spinal injury may require weeks or even months. If meticulous care of the skin, bladder and limbs, including massage, passive motion of joints and corrective splinting be maintained, many seemingly hopeless cases will recover a great measure of useful function.

PERIPHERAL NERVE INJURIES

In simple lacerations of soft tissue made with sharp edged or pointed instruments peripheral nerves are often divided cleanly with minimal contusion of the nerve trunk on either side of the division and without loss of nerve tissue either immediate or late. In such cases the two ends of the divided nerve can be easily approximated without tension. Suture of the nerve in this type of injury may be performed at the same time that first surgical care is given to the flesh wound provided that the wound is fresh, suitable instruments are at hand, time is sufficient and other circumstances favorable.

Accepted surgical principles and technique should be employed in repair of both nerve and flesh wound. Interrupted sutures of fine silk or tantalum wire placed in the epineurium should be used for suture of the nerve. Primary closure of skin is mandatory if suture of the nerve has been performed. Drains are generally undesirable but if considered temporarily necessary on account of ooze, they should never come in contact with the suture line of the nerve and should be removed during the first 4 hours after operation.

Sulfanilamide powder may be dusted lightly into the wound and about the suture line. This drug increases scar tissue reaction slightly in the soft tissues about the nerve but does not interfere with the regeneration of the nerve. Evidence is accumulating however to indicate that sulfadiazine given by mouth in sufficient quantity to maintain a high blood level of the drug affords as great or even greater protection against infection than does sulfanilamide powder placed directly in the wound without certain undesirable secondary effects caused by the latter procedure.

In the severe penetrating or crushing wounds commonly encountered in war in

which major nerves have been divided definitive suture of these nerves at the time of first surgical care while theoretically desirable is almost never feasible. The reasons are as follows. In the first place in badly contused nerves the full extent of the intrinsic hemorrhage and other damage to the bruised ends of nerves cannot be immediately appraised nor can the ultimate line of demarcation between viable and nonviable nerve be determined. Second if much of the nerve has been shot away reapproximation of the ends of the divided nerve will be possible only if the nerve is mobilized for considerable distance on both sides of the injury. To carry such dissection away from a grossly contaminated and potentially infected field proximally into clean tissues would entail serious and unnecessary risks. Third proper mobilization and suture of a badly damaged nerve might well require several hours of operating when neither the patient's condition nor the exigencies of the situation would justify the expenditure of so much time. And finally the surgical necessity of leaving most battle wounds of soft tissue unsutured for 5 to 10 days after initial débridement would almost certainly result in a breaking down of the line of sutures.

In practice battle wounds usually do not reach the surgeon until 12 to 48 hours after they have been incurred at which time the first concern is the prevention of sepsis in the soft tissues especially gas bacillus infection. This is dependent largely upon proper débridement of the wound. Débridement of the skin should be conservative but exploration of the wound should be very thorough. The tracts of missiles should in most instances be left open all foreign matter such as bits of clothing should be scrupulously sought out and removed and all muscle which appears deprived of its blood supply badly crushed or grossly contaminated should be excised. The free ends of divided nerves if these be seen should be drawn together when possible with several temporary sutures of fine catgut or tantalum wire placed in the epineurium to prevent retraction of the nerve ends pending final definitive suture at a later date. Silk sutures should not be used for this purpose as the silk will remain as infected foreign matter

The wound is not sutured but merely covered with a protective gauze dressing. It is best not to introduce sulfanilamide powder locally into the wound but a high sulfa level in the blood stream should be early established and maintained by the systemic administration of sulfadiazine.

Secondary closure of the wound may usually be performed 5 to 10 days after débridement. At the time this is done there should be a therapeutic sulfonamide level in the blood stream. The edges of the skin should again be freshened up and granulation tissue trimmed away. The skin should then be undermined and mobilized as much as necessary to effect approximation of its edges and sutured with simple or vertical mattress sutures. Moderate tension is well tolerated and is justified if necessary to effect closure. Drains are not needed and should not be used. Neither sulfanilamide or penicillin should be placed in the wound but a therapeutic level should be maintained in the blood until the wound has healed. Sutures may be removed as a rule after 7 to 10 days and the wound may be regarded as healed 2 to 3 weeks from the time of operation.

The final definitive suture of the nerve may be performed 2 or 3 weeks after the sutures have been removed. At this time proximal and distal segments of the nerves should be exposed and the ends of the nerves freed from surrounding cicatrix intrinsic scar tissue excised from the terminal ends of the nerve segments the nerve trunks mobilized as extensively as necessary to obtain approximation of the segments without tension and end-to-end suture performed. The fundamental requirement for all nerve suture is that it be done without tension. The actual suture should be made with interrupted sutures of fine silk thread or tantalum wire placed only in the epineurium. Following this the extremity should be immobilized with neighboring joints in positions of flexion for approximately 3 weeks. After this another 3 weeks should be allowed to get the extremity again extended.

Physical therapy should be instituted about the third week after suture. This should include daily massage to improve circulation

passive and active motion to keep joints, tendons and muscles supple and galvanic stimulation applied directly to individual denervated muscles to preserve the contractility of muscle element and to prevent the atrophy of disuse. The minimum effective galvanic stimulation consists of 30 contractions of each paralyzed muscle repeated three times daily three days each week. More frequent stimulation is of course desirable.

Splints should be used as needed to re-enforce weakened or paralyzed muscles and prevent contractures but these splints should be of such a type as to allow free voluntary and passive movements of all joints. If plaster-of-Paris splints are used they should be worn only at night and left off during the daytime and the patient encouraged to carry out maximum passive and active movements during his waking hours.

THIOURACIL—ITS USE IN THE PREOPERATIVE TREATMENT OF SEVERE HYPERTHYROIDISM

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EMITRILACL obtained from the clinical use of thiouracil over a period of 2 years permits certain conclusions regarding this potent biochemical agent. Thiouracil does reduce the elevated metabolic rate of hyperthyroidism to normal if it is administered over a sufficient length of time in addition there is a gradual disappearance of all hyperthyroid manifestations except those of the eyes if these manifestations are very pronounced before treatment is begun. Conclusive proof has been definitely established that thiouracil possesses great therapeutic value in the preoperative management of severe hyperthyroidism. Consistent and permanent remission of hyperthyroidism by prolonged administration and then with drawal of thiouracil seems highly unlikely. Considerable time and further careful observations will be required to determine this possibility.

Further comparisons can now be made between the pathologic physiology of the hyperthyroid gland under iodine therapy and that following thiouracil administration. Observations have been made on the thyroid tissue removed at operation from patients receiving thiouracil alone and thiouracil in combination with iodine. An attempt will be made to evaluate the findings.

This report will be discussed under 3 headings: (1) clinical observations on severely hyperthyroid patients prepared for thyroidectomy with thiouracil (2) comparison of the action of Lugol's solution with thiouracil on the hyperthyroid gland and (3) pathologic observations on thyroid tissue removed at operation from patients treated with thiouracil only and thiouracil in combination with Lugol's solution.

CLINICAL OBSERVATIONS

Thiouracil has been used at the Lahey Clinic in the preoperative management of severely toxic hyperthyroid patients since May 1943. In dealing with the hyperthyroid patient surgically we were convinced early that thiouracil is of great advantage since it has the power to bring about a positive remission in patients who are dangerous risks or who are so toxic as possibly to require multiple stage procedures. In addition to eliminating two stage thyroidectomies entirely deaths which result from so called postoperative thyroid storm or reactions are avoided with certainty. Patients with mild hyperthyroidism continue to be prepared with iodine since in this group sufficient improvement occurs to permit thyroidectomy without risk and the dangers entailed with the use of thiouracil are thereby avoided.

One hundred ninety patients with severe hyperthyroidism have now been treated preoperatively with thiouracil and have gone through thyroidectomy. Both types of hyperthyroidism were represented in this group—primary hyperthyroidism or Graves disease and adenomatous goiter with hyperthyroidism. Response to thiouracil therapy was equally satisfactory in the two groups. When treatment was continued sufficiently long no patient failed to respond satisfactorily.

In the first 100 patients treated there were 83 females and 15 males. The age varied from 11 to 77 years the average age was 45 years. Forty four patients were over 50 years of age. The average duration of the hyperthyroidism was 4 months. Almost half 43 patients had had hyperthyroidism for more than 5 years of these 11 had been ill for more than 5 years. Twenty five of the 100 patients had lost more than 40 pounds average weight loss being 25 pounds. The average basal metabolic rate was +40. 54 patients had initial rates over +4

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All of the patients were considered to have severe hyperthyroidism since most were in the older age group the disease was usually of long duration considerable weight loss had occurred and the basal metabolic rates were usually high. Thirty five of the 190 patients were classified as thyrocardiacs having either heart failure or auricular fibrillation without heart failure. This latter group of patients in our experience has in the past carried the highest mortality rates following thyroid surgery.

PLAN OF TREATMENT

For most patients treatment is ambulatory. Those with hyperthyroidism and associated heart failure or those extremely ill from hyperthyroidism alone are admitted to the hospital. In the former group combined cardiac and thiouracil treatment is begun and when cardiac compensation is restored after 10 to 14 days these patients are discharged to carry on treatment at home. In the latter group improvement is usually sufficient after 7 to 10 days to permit continuance of treatment at home. Patients are advised to eat a high calorie diet three full meals a day with lunches between meals. Physical activity is slowly increased as the improvement in each patient's condition seems to warrant it. Some patients have been confined to bed for as long as 2 to 3 weeks at the beginning of treatment. All patients, those hospitalized and then discharged and those not hospitalized are seen every 10 days to 2 weeks at the clinic or by the referring physician for routine examination and white and differential blood counts. If suspicious change in the blood is observed or any other toxic manifestation is suggested the patient is seen more often. Patients are advised as to possible toxic reactions and told to call their physician at once if any should occur.

Thiouracil is administered in a total daily dose of 0.6 gram 0.2 gram at 7 a.m., 2 p.m., and 9 p.m. This full dose is continued until the maximum benefit is obtained. At this point all hyperthyroid manifestations will have subsided with the basal metabolic rate being normal. The objection to reducing the dose of thiouracil as improvement occurs is that the duration of treatment may be pro-

longed and if the dose is reduced too rapidly the symptoms may actually increase. A treatment. Also discontinuing the thiouracil too long before thyroidectomy may permit an increase in hyperthyroidism. Our early experience with the use of thiouracil has led to the conclusion that thyroidectomy should not be performed before optimum improvement is obtained. Since short of this an unsatisfactory course under anesthesia and alarming postoperative reaction may occur thereby mitigating the complete benefit of preoperative thiouracil therapy.

The time required to accomplish the desirable degree of improvement necessary to permit safe thyroidectomy is determined fairly accurately from the height of the basal metabolic rate. It has been found that approximately one day of treatment with 0.6 gram of thiouracil is required for each percentage of elevation in the basal metabolic rate. For example a patient with a basal metabolic rate of +55 will require approximately 55 days of thiouracil therapy to bring the basal metabolic rate to normal. Those patients who have received Luol's solution before the administration of thiouracil responded less quickly and usually required a slightly longer period of treatment to return the metabolic rate to normal. Those patients who had had hyperthyroidism of short duration 2 to 3 months responded more quickly to treatment than did those who had had the disease a longer time. Those patients with very large glands responded more slowly but on the whole the size of the gland did not seem to be an important factor in the time necessary to reduce the metabolic rate to normal. With this knowledge individualizing the treatment of each patient the date of readiness for operation can be accurately estimated and hospital arrangements can be made far in advance. There was no patient who was thiouracil resistant and in no case was there failure to bring the basal metabolic rate to normal if treatment was continued sufficiently long.

The average initial basal metabolic rate of the first 100 patients having thyroidectomy was +49. After an average of 57 days of treatment the average basal rate was +

Three patients received thiouracil for over 100 days and 59 patients for over 50 days. The average gain in weight was 12 pounds with 19 patients gaining over 20 pounds.

Surgical procedures. Of the total 190 patients 177 were subjected to subtotal thyroidectomy and 14 patients had hemithyroidectomy. Of these latter 14 patients 4 had very large goiters and it was thought at the time of operation unwise to do a subtotal thyroidectomy. These patients were treated early in our experience before the smooth anesthesia and postoperative course of patients treated adequately with thiouracil had been observed. Since thyroid toxicity is absent the time factor in the operation is no longer important so extremely large glands are now removed at one stage. Four patients were not treated long enough with thiouracil to permit subtotal thyroidectomy without risk as indicated by an unsatisfactory anesthesia course. These cases also occurred early in our experience before optimum improvement prior to operation was thought essential. Five patients were prepared with thiouracil for second stage thyroidectomy the first stage having been performed following iodine preparation. One patient had only a hemithyroidectomy because of the extreme technical difficulty in removing a recurrent goiter. There were no postoperative deaths.

When the first patients receiving thiouracil underwent thyroidectomy a most unsatisfactory surgical complication was encountered. The thyroid gland was found to be soft and friable and bleeding of the entire operative site was so extensive that there was difficulty in keeping the field sufficiently dry to carry out the usual desired surgical technique including the isolation of the parathyroid glands and the recurrent laryngeal nerves. Since 24,000 patients with goiter have been operated upon in the surgical department of the clinic all of the surgeons are familiar with all of the technical difficulties which may arise while doing a subtotal thyroidectomy in hyperthyroidism. If they complain of really distressing technical difficulties in operating upon these patients who have been prepared solely with thiouracil it must be assumed that these technical difficulties are really of serious character

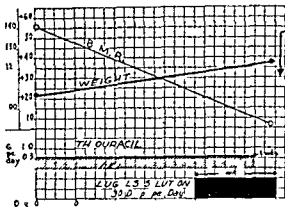


Fig. III. Case showing combined effect of thiouracil and Lugol's solution on basal metabolic rate and weight. The patient was a 53-year-old female, with a history of hyperthyroidism, who had been treated with Lugol's solution for 30 days prior to operation. The thiouracil was administered at a dose of 30.0 mg. daily. The patient's weight increased from 105 to 145 pounds, and her basal metabolic rate decreased from 135 to 85.

acter and in no way imaginary. Hemostats double hooks or even ligatures fail to hold or pull out on the slightest traction. Oozing is almost ceaseless and is controlled only with the greatest patience and difficulty. It was also often impossible to do as radical a thyroidectomy as is desirable. After suffering through a number of these operations it was the opinion of the operating staff that the desirable effect of thiouracil upon the basal metabolic rate was being considerably offset by the undesirable difficulties entailed in carrying out the subtotal thyroidectomy.

The friability of the thyroid gland was overcome when Lugol's solution was administered during the 3 week period immediately before operation. For 2 weeks the iodine and thiouracil are administered simultaneously and during one week preoperatively the thiouracil is discontinued and only iodine is administered. The thiouracil is discontinued 1 week before operation since it has been determined that the basal metabolic rate continues to drop even though the thiouracil is stopped. It is also suspected that involution is furthered when thiouracil is not being administered. Also the danger of possible toxic reactions from the drug developing at the time of operation is avoided by this plan. The supplementary use of iodine preoperatively is not required in patients with adeno-

TYPE OF REACTION	Month	1	2	3	4	5	6	7	8	9	10	11	12
G. NCK. CYT. EN.	3 CA. ES.												
FE. R.	EAS.												
N. ER. PT. N.	CAS. ES.												
EDEM. F. SK. N.	CA. ES.												
W. GLAN.	CA.												
		3	3	(CASE)							

Fig. Types of toxic manifestations of thyrotoxicosis. 1. Duration of treatment. 2. Time of onset. 3. Type of reaction. 4. Case number. 5. Patient's name. 6. Age. 7. Sex. 8. Race. 9. Religion. 10. Education. 11. Occupation. 12. Social status. 13. Family history. 14. Personal history. 15. Physical examination. 16. Laboratory studies. 17. Treatment. 18. Outcome. 19. Follow-up. 20. Conclusion.

matous goiters since this type of gland is not altered by thiouracil therapy.

An example of the combined use of thiouracil is given in Figure 1. In this typical case with severe hyperthyroidism with a basal metabolic rate of $+55.06$ gram of thiouracil was given daily for 54 days its administration was discontinued 1 week before operation and Lugol's solution was given daily during the 3 week preoperative period. The basal rate before operation was $+6$. The iodine given preoperatively produced firmness of the gland the palpable thrills and bruits became less marked and at operation the thyroid was sufficiently firm so that no technical difficulty was encountered.

In patients adequately treated with thiouracil the pulse remains constant during anesthesia as does the blood pressure in contrast to the rising pulse rate and blood pressure in patients treated preoperatively with Lugol's solution alone. No evidence of toxicity is observed the anesthesia course being that seen during the removal of a nontoxic adenomatous goiter. The postoperative course is also free of reaction. The worry and concern over postoperative reactions have now been entirely eliminated. The intensive use of sedation intravenous fluid and oxygen administration postoperatively is no longer necessary. Because of these changes a revision of postoperative treatment after thyroidectomy has become necessary. Overtreatment with thiouracil which produces a myxedematous state

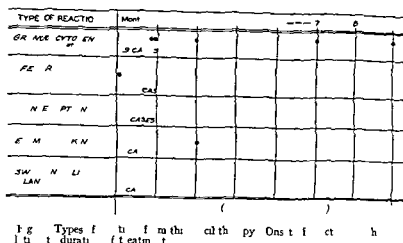
must be avoided since patients with myxedema are extremely sensitive to anesthesia and preoperative and postoperative sedation. When patients are myxedematous even small doses of sedation may suppress the respiration and with the usual presence of mucus may lead to pulmonary complications.

TOXIC REACTIONS DUE TO THIOURACIL

Toxic manifestations (Fig. 1) developed in 3 patients receiving thiouracil 18 of these being in the aforementioned group operated upon. The reactions consisted of granulocytopenia 9 patients fever reactions 7 patients skin eruption 4 patients scleredema 2 patients and swelling of the salivary glands 1 patient.

Leucopenia with granulocytopenia is the most serious and alarming of all the reactions to thiouracil. The blood changes in the 9 cases occurred as early as 3 days and as late as the 9th month the dose of thiouracil varying from 0.6 to 0.9 gram daily. The changes in the blood usually occurred quite suddenly with a reduction in the total white count and in the percentage of polymorphonuclear cells. The total white counts in this group were 4700 4200 4000 3800 3850 2400 1600 1000 900 with the respective polymorphonuclear count being 12 per cent 45 per cent 12 per cent 23 per cent 34 per cent 36 per cent 6 per cent 0 and 0 per cent not a proportionate

Fig. 1. Toxic manifestations of thyrotoxicosis. 1. Duration of treatment. 2. Time of onset. 3. Type of reaction. 4. Case number. 5. Patient's name. 6. Age. 7. Sex. 8. Race. 9. Religion. 10. Education. 11. Occupation. 12. Social status. 13. Family history. 14. Personal history. 15. Physical examination. 16. Laboratory studies. 17. Treatment. 18. Outcome. 19. Follow-up. 20. Conclusion.



matous goiters since this type of gland is not altered by thiouracil therapy.

An example of the combined use of thiouracil is given in Figure 1. In this typical case with severe hyperthyroidism with a basal metabolic rate of $+55$ to 6 gram of thiouracil was given daily for 34 days its administration was discontinued 1 week before operation and Lugol's solution was given daily during the 3 week preoperative period. The basal rate before operation was $+6$. The iodine given preoperatively produced firmness of the gland the palpable thrills and bruits became less marked and at operation the thyroid was sufficiently firm so that no technical difficulty was encountered.

In patients adequately treated with thiouracil the pulse remains constant during anesthesia as does the blood pressure in contrast to the rising pulse rate and blood pressure in patients treated preoperatively with Lugol's solution alone. No evidence of toxicity is observed the anesthesia course being that seen during the removal of a nontoxic adenomatous goiter. The postoperative course is also free of reaction. The worry and concern over postoperative reactions have now been entirely eliminated. The intensive use of sedation intravenous fluid and oxygen administration postoperatively is no longer necessary. Because of these changes a revision of postoperative treatment after thyroidectomy has become necessary. Overtreatment with thiouracil which produces a myxedematous state

must be avoided since patients with myxedema are extremely sensitive to anesthesia and preoperative and postoperative sedation. When patients are myxedematous even small doses of sedation may suppress the respiration and with the usual presence of mucus may lead to pulmonary complications.

TOXIC REACTIONS DUE TO THIOURACIL

Toxic manifestations (Fig. 2) developed in 3 patients¹ receiving thiouracil 18 of these being in the aforementioned group operated upon. The reactions consisted of granulocytopenia 9 patients fever reactions 7 patients skin eruption 4 patients sclerodema 2 patients and swelling of the salivary glands 1 patient.

Leucopenia with granulocytopenia is the most serious and alarming of all the reactions to thiouracil. The blood changes in the 9 cases occurred as early as 23 days and as late as the 9th month the dose of thiouracil varying from 0.6 to 0.03 gram daily. The changes in the blood usually occurred quite suddenly with a reduction in the total white count and in the percentage of polymorphonuclear cells. The total white counts in this group were 4300 4200 4000 3800 3850 2400 1600 1000 900 with the respective polymorphonuclear count being 12 per cent 45 per cent 12 per cent 23 per cent 34 per cent 36 per cent 6 per cent 0 and 0 per cent not a proportionate

Fig. 2. Thiouracil (per cent) of 96 patients

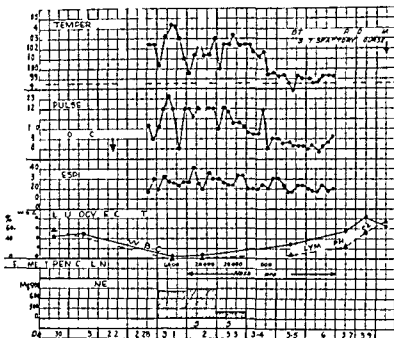


Fig 3 Agranulocytosis with leukopenia manifested itself gradually after the start of therapy. The clinical picture of agranulocytosis developed on the 31st day of treatment. The patient was treated with penicillin, folic acid, and vitamin B₁₂. The patient was discharged on the 39th day of treatment.

drop. Four patients developed the clinical picture of agranulocytic angina: 2 mild and 2 severe. 1 of the latter patients died.

This patient, a woman of 41 years with severe primary hyperthyroidism, had received thiouracil 6 gram daily for 37 days when she developed a mild sore throat. A blood count one week before showed a total white count of 5000, with 70 per cent polymorphonuclear cells. The thiouracil was discontinued. She then had a sore throat at beginning of symptoms. At that time, she was admitted to the hospital. The city where she resided had a severe cold wave. The temperature at that time was 35 degrees Celsius. The white count was 4000, and polymorphonuclear cells were seen. She was given folic acid and vitamin B₁₂ and penicillin with adequate fluid and rest. She died 8 hours after death occurred.

Since that experience, a second case with severe granulocytopenia has been observed.

Febrile and throat symptoms developed 8 days after discontinuation of thiouracil. The total white count was 4000, with 70 per cent polymorphonuclear cells. The patient was treated with penicillin, folic acid, and vitamin B₁₂. The patient was discharged on the 39th day of treatment.

more slowly and by nasal and throat spray, pyridoxine and crude liver extract. In 48 hours the patient was a decided improvement in the patient's clinical condition. In 1 day the white blood count had returned to normal and the patient had a subnormal thyroid reaction.

One patient with mild beginning agranulocytic angina (Fig 4) having only a slight systemic reaction also responded equally well to treatment with penicillin, pyridoxine and folic acid. One patient had mild symptoms and recovered without treatment. The other patients who had blood changes were asymptomatic and following the discontinuance of thiouracil the white blood cells returned to normal within 7 to 10 days.

This experience with the blood changes during thiouracil administration shows that the changes may occur at any time during therapy and that agranulocytosis may develop even as long as a week after treatment is stopped. There is no relationship between

*Given on behalf of the Board of the Canadian Cancer Society, and the Canadian Cancer Society, and the Canadian Cancer Society.

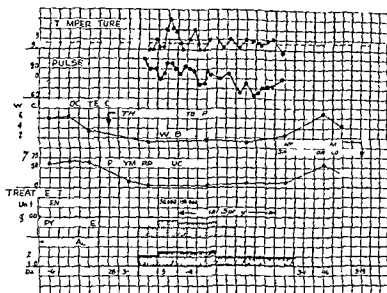


Fig 4. Agranulocytosis in clinical material. Mrs. M. W. aged 64 years. Admitted with hyperthyroidism. Thyroidectomy. B. salm. tab. rat. mutal +43. fnl +9. Thiouracil 56 d. ys.

the dose used and the possibility of a fatality. This makes frequent blood studies essential during treatment and careful observation and intensive therapy are necessary if agranulocytic angina occurs. Although we used other substances in the treatment of patients with agranulocytic angina, penicillin was unquestionably the potent and most beneficial agent producing recovery in the 2 patients under our care. This conclusion seems justified since it was observed that clinical improvement resulting from sterilization of the body occurred before blood changes were noted. Studies aimed at preventing the blood changes are now under way since prevention of blood changes seems essential before free use of thiouracil will be safe.

Fever with severe generalized muscular aching and pain, especially in the upper back and neck, occurred in 7 patients. A fever of 103 degrees developed on the tenth day in 6 patients. In each of these patients the fever subsided promptly on the discontinuance of thiouracil and when 0.1 gram of thiouracil was again administered a fever response with a return of muscular pain took place in 2 to 3 hours. One patient developed fever on the second day of treatment; she also had a return

of symptoms, chills, fever, and nausea when a repeat dose of 0.1 gram was given. Four of these 7 patients who developed fever were then placed on thiobarbital 0.1 gram per day. Three of the 4 continued taking this substance until full control of hyperthyroidism was accomplished at which time a subtotal thyroidectomy was done. The fourth patient developed both fever and leucopenia following the administration of thiobarbital so that the treatment had to be discontinued. Further preoperative treatment in this case was carried out with Lugol's solution.

Four patients developed a severe pruritic skin rash during treatment. The rash was maculopapular in type and fairly well generalized but was particularly noticeable on the arms and around the neck. It occurred on the 21st, 34th, 44th, and 48th day of treatment. In 2 cases the drug was discontinued with prompt relief of symptoms. In both of these patients the hyperthyroidism was well controlled so that thyroidectomy was done without delay. In 2 patients the hyperthyroidism was severe enough to require further treatment. In both of these the dose of thiouracil was cut to 0.3 gram a day and local skin treatment was given. The skin in

proved so that sufficient control of the hyperthyroidism could be accomplished to permit thyroidectomy without reaction. This latter experience in reducing the dose of thiouracil with resulting improvement in the skin needs further certification before this plan can be considered as the solution to the troublesome skin reaction.

In 2 patients sclerodema or early scleroderma like changes were noted. Both patients spoke of feeling muscle bound with the skin feeling tight. This was noted chiefly in the face, hand and upper arms where the skin was found to have lost its normal elasticity. This change occurred after 66 and 70 days of treatment. In 1 the basal metabolic rate was -5 and -6 per cent with the serum cholesterol 203 milligrams per 100 cubic centimeters and in the second case -21 per cent with the serum cholesterol 276 milligrams per 100 cubic centimeters. The latter patient was in a mild myxedematous state as indicated by the basal metabolic rate and cholesterol determination. Neither patient showed the clinical picture of myxedema such as dry skin and swollen lids. A biopsy of the skin from the shoulder area in the second patient showed slight edema of the collagen fibers. In both the skin condition disappeared on stopping the medication. Thyroidectomy was done even before the skin had returned to normal. Excess serum accumulation in the wound postoperatively was noted in these patients.

The twenty-third reaction consisted of marked swelling of the salivary glands. This took place on the 23d day of treatment, disappeared a few days after stopping treatment and quickly returned after 0.1 gram of thiouracil was given. The swelling was not painful and was only troublesome in preventing proper opening of the mouth. The patient was then given thiobarbital without toxic effect until optimum control permitting thyroidectomy was obtained.

These 23 reactions occurred in a total of 196 patients to whom thiouracil was administered or 11.7 per cent as compared with 78 (19 per cent) reactions in a group of 405 cases taken from the literature. (2) The blood changes most serious of all reactions leading

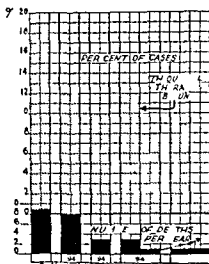


Fig 5. D p th pe tag f st ge th d t s
d p o t p e a t i e d t h f o l l g t u t f i r e
p e a t i t r e t m t w t h t h i

to possible death occurred irrespective of duration of administration or dose of thiouracil given. The fever reactions except in 1 case occurred on the 10th day of treatment and returned when a small dose was repeated. The skin eruption was variable in its occurrence from 1 to 48 days. In 2 patients reducing the dose by 50 per cent permitted continuance of treatment. The edema of the skin occurred fairly late in treatment when the metabolic rate was normal or the patient was in a mild myxedematous state. Swelling of the salivary glands on the 21st day was noted in only 1 case.

The reactions may be considered to have different mechanisms: (a) Blood changes and skin eruption are on a toxic basis. (b) fever and swelling of salivary glands are due to sensitivity. (c) edema of skin results from metabolic disturbance in the skin and subcutaneous tissue.

The use of thiouracil in the management of hyperthyroidism has permitted a great saving of life since thyroidectomy can now be done without risk. In the last 2 years since the introduction of thiouracil there have been 3 postoperative deaths. These patients were not given thiouracil but if it had been given their deaths could probably have been prevented. When it is remembered that the

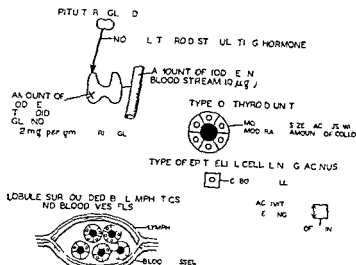


Fig 6 Diagrammatic relation of the normal thyroid physiology

thiouracil treated patients were all severely toxic and represented serious surgical risks the value of thiouracil can truly be appreciated. Since the introduction of thiouracil two stage procedures have fallen from the usual 10 to 12 per cent to 3 per cent (Fig 5). No more two stage operations need be done except for technical reasons. In addition to the lessening of postoperative deaths and the reduction in multiple stage operations a great economic saving was possible in the group of hyperthyroid patients treated since the hospital stay now is 7 to 10 days as compared with weeks when patients were prepared with Lugol's solution and the expense of multiple operations is also eliminated.

COMPARISON OF LUGOL'S SOLUTION WITH THIOURACIL ON THYROID GLAND

Before an approach is made to an explanation of the action of thiouracil and to the combined effects of thiouracil and iodine upon the thyroid gland it may be of interest to discuss a few of the fundamental features of iodine effect upon the thyroid gland as related to its vascularity and friability. These include the effects of iodine upon the histology of the thyroid gland upon metabolism and upon blood iodine as shown by blood iodine studies. An attempt can be made to explain how thiouracil operates how iodine functions

the relation of iodine to thyroxine what involvement of the thyroid is and how desirable it is to obtain the combined effects of thiouracil and iodine in the patients with hyperthyroidism coming to operation.

If we assume that the present conception of hyperthyroidism is sound it is possible to illustrate diagrammatically hyperthyroidism with only one factor missing that is what incites the excess of the pituitary thyroid stimulating factor. It can be shown that as the result of overstimulation of the thyroid there is resulting hyperplasia and that as the result of this stimulation and hyperplasia there is a greater production of thyroid secretion which brings about hyperthyroidism with such dramatic clinical evidence of its effect upon body metabolism.

a Normal thyroid physiology is schematically indicated in Figure 6. The thyroid gland receives stimulation from the thyroid stimulating hormone from the pituitary gland and iodine is taken from the blood stream for the production of thyroid hormone. The normal gland contains 2 milligrams of iodine per gram of dried gland and in the blood at this time there is only 10 micrograms per cent of iodine. The thyroid gland structure has as a unit an acinus which is lined with cuboidal cells. The acinus contains a moderate amount of well staining colloid the latter represents

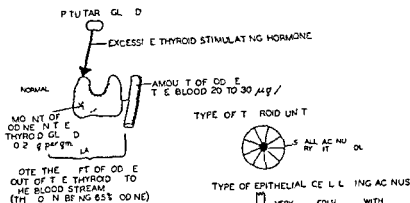


Fig 7 Diagram illustrating the physiology primary hyperthyroidism

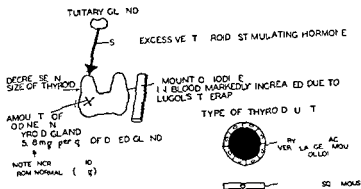


Fig 8 Diagram illustrating the physiology primary hyperthyroidism following administration of Lugol's solution

the normal stored thyroid hormone. The acini are grouped forming a lobule which is surrounded by blood vessels and lymphatics. Movement of thyroid hormone to the body and manufacture of hormone with storage as colloid is dependent on the body's varying requirement for hormone.

b. When hyperthyroidism with its typical hyperplasia occurs it can be shown diagrammatically as in Figure 7. An excess of thyroid stimulating hormone causes an overactivity of the thyroid gland due to hyperplasia of the thyroid cells with increased vascularity. The lining cells of an acinus of the hyperplastic thyroid are high columnar loosely packed with crinkled edges bulging into the acinus. This type of hyperplastic thyroid gland is friable and bleed profusely. A shift takes

place in the iodine from the gland to the blood stream with the thyroid containing one tenth of the usual content of iodine and the blood stream two to three times its normal content.

c. Involution of the hyperplastic hyperthyroid gland can be accomplished by the administration of Lugol's solution (Fig 8). There is still an excess of thyroid stimulating hormone. The thyroid cell reverts to an inactive phase becoming flat and compact appearing to be compressed by the large amount of colloid stored in the acinus. Iodine is increased in the gland up to 5 to 8 milligrams per gram of dried gland. It is this type of acinar distention with a lessened need for an increased blood supply that makes the hyperplastic thyroid become firm so that it is no longer friable. This reduction in vas-

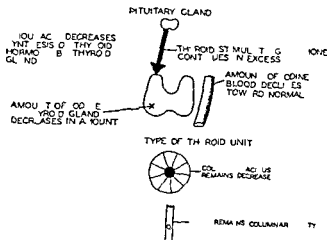


Fig 9 Diagram illustrating the physiological changes in the thyroid gland during hyperthyroidism and the effect of thiothyronine treatment

cularity of the thyroid is demonstrated by a lessening of the thrills and bruits at the superior thyroid pole following iodine administration. At operation a properly iodinated gland shows little bleeding and when incised is pale and relatively dry and on section the dilated acini filled with colloid are readily seen.

d The exact mechanism of thiouracil action still remains somewhat in doubt. Certain studies suggest its action to be as shown in Figure 9. The pituitary stimulation continues to remain in excess. A disturbance in the synthesis of the thyroid hormone takes place and coincident with this there is a decrease in the iodine content of the thyroid gland. A reduction in the blood iodine occurs and the blood iodine level gradually returns to normal as the basal metabolic rate falls. If thiouracil therapy is continued sufficiently long a normal blood iodine content is finally reached. The thyroid cell still shows evidence of hyperplasia as during active clinical hyperthyroidism. This continued hyperplastic state of the thyroid following thiouracil treatment accounts for the increased vascularity of the gland. Bruits and thrills are present at the superior poles together with softness of the gland and at operation excessive bleeding causes technical difficulty. If the thyroid gland is in a high state of hyperplasia at the time thiouracil treatment is begun the hyper-

plasia is increased as noted by the development of marked softness of the gland. If however the gland is firm spontaneously involuted at the time of starting treatment the gland does not seem to undergo great hyperplastic change. Therefore the clinical status of the thyroid gland following thiouracil treatment is dependent on the condition of the gland when treatment is begun.

e The fifth comparative step in the altered thyroid physiology is that which occurs following the use of combined thiouracil and iodine in preparation of the thyroid gland for its removal. Since thiouracil tends to produce a highly vascular gland an attempt at preventing this was made by a combination of thiouracil and iodine administration. Thiouracil was begun and continued up to 1 week before operation with iodine being administered with thiouracil during the last 2 weeks of its use and alone for 1 week before thyroidectomy (Fig 1). Clinically a substantial improvement in the gland occurred—the bruits and thrills lessened the gland seemed to be reduced in size and at operation the thyroid was adequately involuted it was not friable and bleeding could easily be controlled.

Diagrammatically (Fig 10) the pituitary stimulation is apparently still in excess with thiouracil decreasing the synthesis of thyroid hormone. The thyroid gland is still able to take up iodine when given as Lugol's solution.

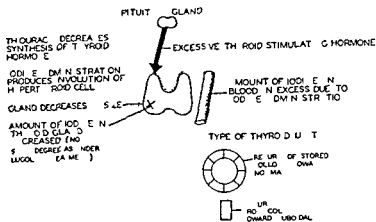


Fig. Diagram illustrating the physiological effects of thyroacil on the thyroid gland.

producing involution there being no complete block to iodine absorption. The gland seems to decrease in size and becomes firm with lessening of the bruits and thrills at the superior poles. Iodine however must be administered before myxedematous levels are reached since absorption does not seem to take place at that stage of metabolism. The iodine content of the thyroid tissue removed at operation is found to be greater following combined thyroacil and iodine treatment than following thyroacil therapy alone (Fig. 1). An excess of iodine occurs in the blood as a result of iodine administration. Histologically a tendency to involution occurs but not to the degree seen with iodine treatment alone.

PATHOLOGIC OBSERVATIONS ON THYROID TISSUE AFTER THIOURACIL ONLY AND AFTER THIOURACIL AND LUGOL'S SOLUTION

A careful pathologic study of thyroid tissue removed at operation was carried out on 77 specimens. These patients were among the first 100 treated and include those patients treated with thyroacil alone and those receiving the combined iodine and thyroacil management.

Particular attention was directed to the state of involution of the gland. For a number of years we have classified the degree of involution on the basis of microscopic findings dividing it into three stages: early involution when the epithelium is still col-

umnar and the colloid scanty and papillary projections present; moderate involution when the epithelium is cuboidal, the colloid moderate in amount and papillary projections not frequent; late involution when the epithelium is low cuboidal or flat, colloid fills the acini and is usually fairly dense and homogeneous and the papillary projections are vestigial. At times instead of each acinus involuting more or less at an equal rate there is a mixture of the three preceding stages; this is designated irregular involution. Some glands usually those with late involution may show foci which we classify as hyperinvolution when the picture almost resembles that of a colloid goiter with flat epithelium and distended acini containing much colloid; the acini remain less than a low power microscopic field in diameter as a rule; the fibrous stroma is not as abundant as seen in a colloid goiter nor does it become loose and edematous as is so often the case in a colloid goiter.

Varying degrees of involution may occur spontaneously in hyperplastic thyroid glands as a result of the diminution of blood supply as through pole ligation as a result of removal of a portion of the thyroid as a result of radiation or as a result of iodine administration. By examination of involuted glands it is not possible to state by what means the involution has occurred.

Fibrosis and lymphocytic infiltration are not essential features of involution nor of the effect of iodine or other substances admin-

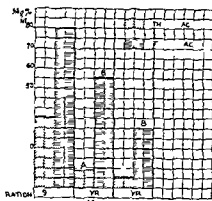


Fig. 1. Comparison of thyroid gland weights in patients with primary hyperthyroidism, treated with thiouracil, and in patients with primary hyperthyroidism, treated with iodine.

istered but depend more on the age of the patient, the length of time that the gland has been hyperplastic and in the case of lymphoid infiltration whether or not there exists general lymphoid hyperplasia in the patient as so often occurs with hyperthyroidism.

MATERIAL AND METHOD

Of the 77 cases in the thiouracil treated group (Table I) 47 were classified pathologically as primary hyperplasia and 30 as secondary hyperplasia. In the few instances in which a two stage operation was performed the second stage specimen was not included in the total.¹ Twelve patients were treated with thiouracil alone, 13 had iodine only before the thiouracil therapy was started. The remaining patients all had iodine pre-

TABLE II — STROMAL INCREASE AND LYMPH INFILTRATION IN PRIMARY GLAND TREATED WITH THIOURACIL

	light	Slight	More	Not
Increased stroma	5			
Lymphoid infiltration		5		

operatively, 1 having had iodine also prior to the thiouracil treatment.

The ages of the patients in the primary group varied from 1 to 77 years, 53 per cent being over 40 years. In the secondary group the ages varied from 14 to 72 years, 77 per cent being over 40 years. Six of the former group and 5 of the latter group were males.

The analysis of the pathology of the thiouracil treated glands resolves itself into two problems: (1) What is the specific effect of any of the drug on the histologic appearance of the gland? (2) What effect on the histologic evidences of activity or involution does thiouracil have? In order to analyze the two problems more clearly each will be considered separately.

SPECIFIC EFFECTS OF THIOURACIL

An attempt was made to determine if it was possible to say from the gross and microscopic examination that any individual specimen was from a patient treated with thiouracil. From the gross appearance there was nothing distinctive in the size, shape or contour. The vascularity in some of the glands was accentuated, a feature which was particularly noted by the surgeon at the time of operation but it was neither constant nor distinctive. The vascularity is similar to that noted in the primary hyperplastic glands removed prior to the time that preoperative iodine came into use.

The average weight of the primary hyperplastic glands from patients treated with thiouracil was 28 grams per lobe. For comparison the average weight of 100 primary hyperplastic glands in cases in which iodine only was given was 4 grams per lobe. The 4 gram difference in the average weight is of doubtful importance and certainly is insignificant as far as any individual gland is concerned since the lobe weight of the thiouracil

TABLE I — TYPES OF GLAND AND TREATMENT

	Thiouracil only	Thiouracil and iodine	Thiouracil and iodine	Thiouracil and iodine	Total
Primary	5	8	20		
Secondary					
Total					

¹Our experience with glands removed in the first stage of the two stage operation is that the weight of the gland is not a reliable index of the degree of hyperplasia. In the few instances in which a two stage operation was performed the second stage specimen was not included in the total. Twelve patients were treated with thiouracil alone, 13 had iodine only before the thiouracil therapy was started. The remaining patients all had iodine pre-

TABLE III —DIAGNOSES (PATHOLOGIC) ON PRIMARY GLANDS

	Thiouracil per cent	N thiouracil per cent
Primary with lymphatic	19	6
Primary with nodular	0	26
Primary with lymphatic	4	42
Primary with irregular	5	8

group varied from 6 grams to 113 grams. Only one specimen was extraordinarily heavy. This was from a patient treated with both thiouracil and iodine and diagnosed as primary hyperplasia with early involution; the two lobes together weighed 225 grams. Those cases which were diagnosed as secondary hyperplasia were too variable to permit comparisons.

Microscopically neither cells nor colloid appeared different in any respect from glands in the same stage of involution histologically when patients had not received thiouracil. In Table II is an analysis of the amount of lymphoid infiltration and stromal increase in the glands with the diagnosis of primary hyperplasia. Here again there was no uniform increase or decrease and nothing greater or less than might be expected in a control group. The degree of lymphoid infiltration was somewhat greater in patients over 40 years of age. The length of time that the patient had received thiouracil or iodine made no apparent difference in the lymphoid or stromal response.

EFFECT OF THIOURACIL ON INVOLUTION

It would be reasonable to expect from the results of the administration of thiouracil to animals that thiouracil given to thyrotoxic patients might keep the gland in a state of histologic hyperplasia and that there would be little evidence of involution in many of the glands even if iodine were given in addition. It has been noted (1, 3) that iodine added to the diet did not prevent the thiouracil effect on animals. Table III is a tabulation of the various pathologic diagnoses made on the primary hyperplastic glands when the patients had received thiouracil compared with a control group of 100 random primary hyperplastic glands of patients who had received only iodine. Although the thiouracil treated case tend to show a higher incidence of early

TABLE IV —DIAGNOSES ON PRIMARY GLANDS IN RELATION TO IODINE THERAPY

	Thiouracil only	Thiouracil and previous iodine	Thiouracil and previous iodine	Thiouracil and previous iodine
Primary with early involution				3
Primary with moderate involution			7	
Primary with late involution			9	6
Primary with irregular involution				3

involution—that is there is considerable histologic evidence of activity—there are still numerous instances of later stages of involution.

Since few patients in whom the diagnosis was primary hyperplasia had not received iodine at some time or another we must assume that the majority of the patients showed a picture which may have been influenced in part at least by the iodine. Table IV is a tabulation of the diagnoses made on the primary hyperplastic glands according to the time that the iodine was received in relation to the thiouracil treatment and the operation. Iodine did not constantly inhibit or further involution no matter when it was used.

In order to determine more critically the response of the gland to thiouracil an estimation of the histologic degree of activity of the thyroid was made in terms of basal metabolic rate points. While such estimations are only approximate in the majority of cases with primary hyperplasia they are reasonably accurate. Cases of secondary hyperplasia were not considered in this manner because of the numerous irrelevant distorting features. The degree of activity thus estimated was compared with the basal metabolic rate at the beginning of thiouracil treatment. A definite

TABLE V —HISTOLOGIC EVIDENCE OF INVOLUTION IN PRIMARY GLANDS

	Thiouracil only	Thiouracil and previous iodine	Thiouracil and previous iodine	Thiouracil and previous iodine
No definite involution			8	6
Definite involution				

involutionary response was considered one in which the basal metabolic rate appeared to have dropped at least 10 points during the treatment. In Table V the responses noted are tabulated. The majority of the specimens showed involution. Only three glands showed an apparent increase in histologic activity during the treatment and two of these patients had had iodine. In 40 of the 47 cases the clinical response to thiouracil therapy was considered good as shown by a marked fall in the basal metabolic rate.

The degree of involution or lack of involution was not found to be dependent upon the manner in which iodine was given or upon age, sex, duration of symptoms or duration of thiouracil treatment.

Gland classified as secondary hyperplasia while more difficult to analyze in this manner seemed to show similar involutionary changes.

COMMENT

Since relatively few of the patients of this series received only thiouracil as the preoperative medication, the comments and discussion must be limited chiefly to observations on the effect of thiouracil when it is used in conjunction with iodine.

The effects of thiouracil alone on gland from thyrotoxic patients are seemingly similar to the effects on glands of experimental animals according to the reports of Moore and associates and Williams and Clute. Their specimens showed evidence of marked activity and with this the usual accompanying features of histologic activity such as increased size, vascularity and height of epithelium, loss of colloid, small acini, frequent lymphoid infiltration and so forth. However we do not believe that this thiouracil effect differs in any way from the picture seen in a hyperplastic gland in a comparable state of activity in which no thiouracil has been used. There are no additional or pathognomonic features present in a thiouracil treated gland which may not be present in a hyperplastic gland when thiouracil has not been given. In our opinion it is not possible to examine a gland and to say from the gross or microscopic appearance of such a gland that the patient has had or has not had thiouracil treatment.

In the series of Williams and Clute (27 resected specimens) and of Moore and associates (26 resected specimens) there was a apparently little evidence of involution except in one case of the latter series. In each group the patients were treated with thiouracil alone. These results contrast with the findings in our series in which the majority showed evidence of involution when treated with both thiouracil and iodine. Rawson in comparing the appearance of biopsy specimens taken prior to thiouracil treatment to the histologic appearance of the gland in the surgical specimen removed later, concluded that in 4 of his 5 cases there was evidence of increased activity while in 1 case about the same degree of activity was evident. It would appear that while thiouracil alone infrequently causes (or allows) definite histologic involution in a thyrotoxic patient, the addition of iodine to the treatment either before or after the thiouracil is administered may alter the microscopic picture considerably with many cases showing good histologic involution.

It is difficult to place an interpretation on these results largely because neither the cause of hyperthyroidism nor the mechanism of action of thiouracil or iodine is well understood. The addition of iodine to the thiouracil treatment did not cause involution routinely nor as frequently as when iodine was used alone preoperatively. It was impossible to correlate the degree of histologic involution with such factors as age, sex, duration of symptoms, severity of symptoms or length of time of either thiouracil or iodine therapy.

It has long been known that spontaneous remission of the symptoms of hyperthyroidism accompanied by morphologic evidence of involution in the thyroid gland may occur. Our material derived from thyroidectomies prior to the time when iodine came into general use as a method of preoperative medication showed frequent evidence of spontaneous involution. A few patients after treatment with thiouracil alone have apparently been able to discontinue the drug without recurrence of thyrotoxic symptoms. Perhaps the involution found in some cases is a manifestation of a spontaneous remission and is independent of the thiouracil effect.

SUMMARY AND CONCLUSIONS

1 Thiouracil has been proved to be a most valuable drug for the preoperative preparation of patients with severe hyperthyroidism.

2 The drug must be administered until the maximum benefit is obtained and at that time subtotal thyroidectomy can be carried out without risk. The dose of thiouracil used was 6 gram a day and it was found that approximately one day of treatment was required for each percentage of elevation in the basal metabolic rate. Previous administration of Lugol's solution prolonged treatment and those patients with hyperthyroidism of short duration responded more quickly.

3 The technical difficulties at operation which occurred in patients treated only with thiouracil have been overcome by the added use of Lugol's solution during the 3 week period immediately before operation; no thiouracil is given during the week immediately before operation.

4 Since thiouracil cannot be given without danger—evidence of toxicity occurred in 11 per cent of patients treated—patients must be carefully observed during treatment. Granulocytopenia is the greatest potential danger so frequent blood tests are imperative.

5 Diagrammatic comparison is attempted of the altered pathologic physiology in the thyroid gland from normal during hyperthyroidism under treatment with Lugol's solution following thiouracil and lastly with combined administration of thiouracil and Lugol's solution.

6 The results of the study of 77 thyroid glands surgically resected from patients with hyperthyroidism who had been treated preoperatively with thiouracil are reported. Twelve of the patients were treated with thiouracil alone; the remainder had iodine in

addition at some stage of the course of treatment.

7 From the gross and microscopic examination of an individual gland no specific effect was found which might be attributed to thiouracil. It was not possible to identify a thiouracil treated specimen from a hyperplastic gland which has had no previous thiouracil therapy. However some thiouracil treated glands are larger than would be expected from the clinical course or microscopic picture.

8 The increased vascularity of the gland noted by the surgeon in those patients treated with thiouracil is of course not apparent in pathologic material.

9 When iodine is used in conjunction with thiouracil the majority of the specimens show histologic evidence of involution especially when the microscopic picture is compared with the initial basal metabolic rate.

10 The addition of iodine to the treatment either before or after thiouracil is administered did not constantly bring about histologic involution; moreover the incidence of involution was not as frequent as when iodine was used alone.

11 It was not possible to correlate the degree of histologic involution in this series with such factors as age, ex duration or severity of symptoms or duration of either thiouracil or iodine therapy.

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ESOPHAGOGASTROSTOMY IN THE TREATMENT OF CARDIOSPASM

O THERON CLAGETT M D F A C S HERMAN J MOERSCH M D
ALBERT FISCHER M D Rochester Min s t

ESOPIIAGOGASTROSTOMY is not intended as an initial procedure in the treatment of cardiospasm. The vast majority of patients who have cardiospasm obtain excellent results from dilatation of the cardia by means of the hydrostatic dilator and it is only in the exceptional case that surgical intervention becomes necessary (10). It is not our purpose to review the general subject of cardiospasm which has been very ably done in recent publications by Ochsner and DeBakey (11, 12) Gray and Skinner and others. It would appear from a review of the literature of those cases of cardiospasm or achalasia of the esophagus in which surgical treatment was used that the best results were obtained in the group on which esophago gastrostomy was performed. Of the various surgical procedures employed in general those done through a transperitoneal approach have carried a much lower operative mortality rate than have the transpleural procedures.

As was pointed out by Lambert 30 years ago and recently emphasized by Gray and Skinner dilatation of the esophagus in cardiospasm usually assumes one of three typical forms: fusiform, flask shaped or sigmoid shaped. In the fusiform type the lumen of the esophagus increases to a point midway between the cricoid cartilage and the cardia and then tends gradually to decrease in size. In the flask shaped variety the dilatation is immediately above the cardia. In both of these types the cardia is the most dependent portion of the dilated esophagus and both can usually be relieved by hydrostatic dilatation. Cardiospasm in which the esophagus elongates as well as dilates and therefore becomes sigmoid shaped is the rarest of the three types. Here the increased length of the esophagus is accommodated by a curved course. The most dependent point of the dilated esophagus rests on the diaphragm to the right and posterior to the cardia. The esophagus then ascends to the left and enters the abdomen through the diaphragm at a higher level. A reservoir is thus formed below the level of the cardia. Gray and Skinner have pointed out that

this a g u l a t o n and this reservoir make dilatation from above more difficult and may result against a satisfactory result.

We have recently operated on 4 patients with cardiospasm of long standing in whom dilatation of the cardia had failed to produce more than temporary relief. The operative procedure employed in these 4 cases was esophago gastrostomy. Although in each case a good functional result was obtained the dilated esophagus did not appear to reduce appreciably in size following operation. An observation which has also been noted after esophageal dilatation.

CASE 1. A white female, aged 57 years, first noted the difficulty in swallowing about 1944. The difficulty was at first mild but gradually increased. She had no pain or regurgitation. The difficulty was more than temporary relief. The operative procedure employed in these 4 cases was esophago gastrostomy. Although in each case a good functional result was obtained the dilated esophagus did not appear to reduce appreciably in size following operation. An observation which has also been noted after esophageal dilatation.

CASE 2. A white female, aged 57 years, first noted the difficulty in swallowing about 1944. The difficulty was at first mild but gradually increased. She had no pain or regurgitation. The difficulty was more than temporary relief. The operative procedure employed in these 4 cases was esophago gastrostomy. Although in each case a good functional result was obtained the dilated esophagus did not appear to reduce appreciably in size following operation. An observation which has also been noted after esophageal dilatation.

CASE 3. A white female, aged 57 years, first noted the difficulty in swallowing about 1944. The difficulty was at first mild but gradually increased. She had no pain or regurgitation. The difficulty was more than temporary relief. The operative procedure employed in these 4 cases was esophago gastrostomy. Although in each case a good functional result was obtained the dilated esophagus did not appear to reduce appreciably in size following operation. An observation which has also been noted after esophageal dilatation.

CASE 4. A white female, aged 57 years, first noted the difficulty in swallowing about 1944. The difficulty was at first mild but gradually increased. She had no pain or regurgitation. The difficulty was more than temporary relief. The operative procedure employed in these 4 cases was esophago gastrostomy. Although in each case a good functional result was obtained the dilated esophagus did not appear to reduce appreciably in size following operation. An observation which has also been noted after esophageal dilatation.

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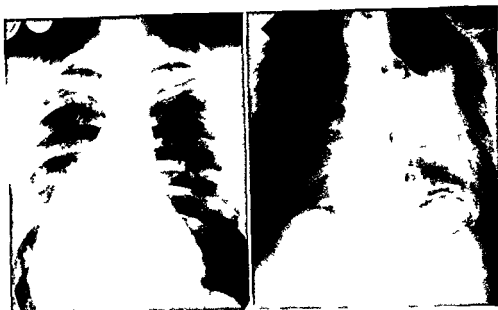


Fig 1 ft C lost t fth h g d g f m d t l h d d t
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Fig C se A t post f soph gu b g m k d d l tat i t t ty Fl k
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th tm se ral h ft m l O sem oc
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F 3 Ca Lat 1 w f esophagu

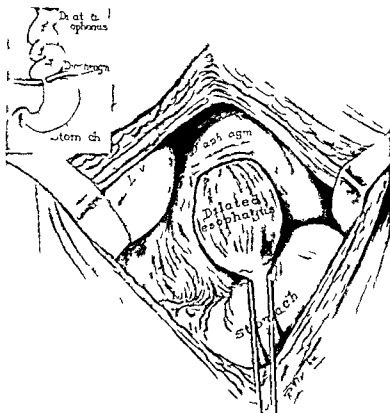


Fig. 4. Operation for dilatation of the esophagus.

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ll d q t m t s f d d f o o d b t th
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p s a u f t r i l y T t y f i d y f t p e r a t p t t
p e r m i t t e d t t m t h i h m At th u t t h
h l d d h b l t t l i b e l d t
A o e t g r a m t t h t h e d t e a s e t h
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e s s a r y t d k g t f t t m t
C A h i l a b o e d 44 y e a r s e d t t h
M y C l i m e M h 4 44 H h f m p l a u t
l y p h n f 4 y r s d Th d i l l y
u n g h d b e c o m p o r e s l y r s e A
f i r s t h h d t e d h a t o c a s o l d f o o d l d
m t b e m l o d e d i n h u e s o p h a g u H l i f
d b d k t L a t l i q d s b e c a
d i n c u l t t l l I d l t a t f t h e s o p h o u
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e s o p h o u A t t m p t e d l i t e s f u l H
c a m e t t h h b e c a u s e h h a d b e e d e d h a
p e r a t u h h h w h e d d

Th p t t p p e e d l l h e d l t c u y l
H i s g l p h l m t l l a b o t y t l e s
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t t y f t h e s p h o u (F 6)
D l t t f t h l b y m f s o d l h
P l m h d o s t d l d t Th p a t
d i d t b t a i d q l f f m t h d l t
c o t e d t h d b l d i f f l y l l
t w t h g h t d a b l d g l t r
O A p l 944 e s c h g e a t o s t m y p e f m l
t h q e s e n b l g t h d s c b d t h f
C a s e b e p l y e d A R h f t b e p s e d t h
t h e b e y d h t l t j j m f t
p e r a r y f e d f x p l f b d l l
r u l u n d g s h t h a k d t t e s o p h
g a j t d m d d l t a t f s o p h a u
O t h d y f p e t d t e d
t l y t h R h f b e t h h M t h d y
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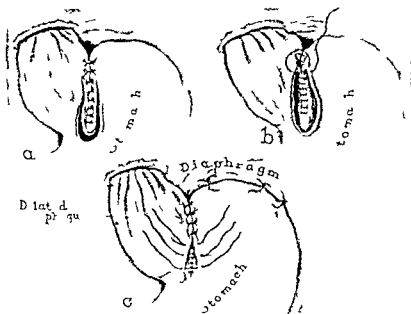




Fig 6 C L t l ew f s ph gu h m
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ly e l d oc l p l d e r s t h r o v
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with m l d d l t t f t h e s o p h a g u (f e s q i
O Oct be 7 94 th ca d dilated l l
5 F d ld be p d O N be 7
d i l t a t u b y m f t h P l m m h y d o s t d l e
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94 the p t t became cut ly l l H t m p e t
t s d g r e e s f d h m p l d f s e r e g a
p Th p m of th t b d o m a l
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t a u d t a f t h e s o p h a g u d g d l t t f t
c a d i h t h p t r y p u m n h a d d e v l o y e
H q t l l f 3 k b t p o d d t s e n
m n a g m e t H a b l t t m t h b
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s a m w h h f i r t s e e t t h l
O J e 944 p h g g a s t o s t m y s p e r f m l
Th b d m x p l e d t h g h a l f t u p t u s
c i v s e r a t h t h a t h d i l d e s o p h a g u
t t d d i e m o l A l g o d l
m d t h r g h t h d i d t l e d p t
s o p h g u d d w t t h t m h t h d e f e c t a s
l e d t l y t h f t i o u
h m c a t g u t t a d n t t r u p t l



F l f Cas 3 Ant post n f e s p h m
F 8 C s e 3 Lat l f e s o p h g u h f f
h p e d ty h h h b e m g d



Fig 1. Left: Case 4. Anteroposterior view of the esophagus showing a dilated esophagus. Right: Case 4. Lateral view of the esophagus showing a dilated esophagus.

lk Th ew t m dly dm t d t f g F
g m f p o d e d f l m l s p k l d b o t h
t m d t P o s e d s e t e d t h
g Th f t p e t s e t f l Th
p t t l f t h h p t a l d y s f t h p e t d
t m e d t h h m 6 d y s t
A l t t f m t h p t t d S e p t m b 0 4 4
t t e d t h t h d b e e t g l l t y p e s f f o o d t h t
y d f f i c u l t y h t s o e H h d g a e d 4 p o d (S
k g m) l g R o c h e s t e r d k g 3 d y

The great majority of patients suffering from cardiospasm can be treated successfully by hydrostatic dilatation of the esophagus. Approximately 90 per cent of these patients are completely relieved by one course of treatment. In 30 per cent of cases there is a tendency for the condition to recur. The recurrence may take place at any time from immediately after treatment to as much as 3 years after treatment. If the condition does recur, the great majority of patients can be successfully relieved by subsequent dilatation. Dilatation of the esophagus by means of the hydrostatic dilator can be employed with very little risk. In our experience the risk has been less than 0.1 per cent. In approximately 25 per cent of cases hydrostatic dilatation does not prove efficacious and in these cases surgical intervention is indicated.

Of the surgical procedures which have been recommended we prefer esophagogastronomy

performed through a transabdominal approach. A review of the literature and our own results indicate that this is a safe procedure which accomplishes good results. Although good functional results are obtained, one should not expect retrogression in size of the dilated esophagus after the operation.

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CHONDROMALACIA OF THE PATELLA

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CHONDROMALACIA of the patella is a pathological entity and may be a cause of internal derangement of the knee. Buedin first drew attention to its formation of the cartilage in 1906 and again in 1908 by reporting 15 cases in which operation had been performed. In 1910 Ludloff reported one case. Ahausen in 1919 considered trauma to be the etiological factor and drew attention to the symptoms and physical signs in this condition. He advised excision of the impaired cartilage. Aleman is credited with first using the term chondromalacia of the patella in 1916. Kaplan followed Aleman's patients over a period of years and in 1940 reported additional cases. The works of Aleman, Karlsson, Sifert, Obermiedermayr and Ovre are the most complete investigations of chondromalacia of the patella with follow-up examinations of the majority of cases in which operations had been carried out. Their conclusions as to the progress of the disease may be summarized as follows: 1st phase—patellar contusion; the cartilage becoming fluid phase—chondral malacia; the cartilage being rubbed and split by longitudinal and transverse fissures; 3rd phase—degenerative chondral change and synovitis.

Of 14 consecutive knee arthrotomies performed at the 103th General Hospital for internal derangement there were 9 cases (67%) in which the cause of the derangement was found to be degeneration of the articular cartilage of the patella. This study is based upon the 9 cases and similar one in which operation was done by one of us (E. F. C.) in clinical practice. The relative frequency of curvature estimates that the condition in the adolescent or the young adult is not uncommon and is frequently overlooked because (1) while the history is suggestive of internal derangement of the knee the physical examination is inconsistent largely because of the difficulty in examining the articular surface of the patella (2) the roentgenogram of the patella is equivocal (3) at operation adequate explanation of the patella is frequently not worked out.

Chondromalacia of the patella may be the sole cause of symptoms or it may be the later stages of development associated with other patho-

logical changes in the joint. The commonest associated changes are osteochondritis and to the iliofemoral cartilages.

PATHOLOGICAL CHANGE

The typical appearance of well advanced chondromalacia of the patella resembles shredded meat. The articular surface of the patella presents a softened area with multiple frayed fractures of the hyaline cartilage with particles of cartilage at the margin of the area (Fig. 1). In some cases the size of the area varied from three eighths of an inch in diameter to essentially the entire face of the patella. The location in most cases is in the center of the patella (Fig. 2) but at times the changes occur at the inferior margin or at the mesial border. The area of softening extends into the center and to a distance of the periphery of the area the changes are more superficial. Not uncommonly small cartilaginous bodies are detached from the degenerated area and are free in the knee joint. These become rounded and smooth. As time goes on these loose bodies may be partly or completely calcified (Fig. 3). The earliest changes in the joint may remain confined entirely to the patella but after months or years as abnormal friction between the patella and the femur develops the osteoarthritic changes occur. The changes are then taken on by the rest of the joint as subluxation of the margins of the femoral and tibial condyles and partial destruction of the articular cartilage of the femur. The femoral condyle here they are in contact with the gliding patella.

Microscopic changes consist in a patchy irregular area of cartilage cells the articular cells become quite cellular. The cartilage produced by the cells is irregular in surface contour but does not differ in the respects from the normal. The amereation is frequently seen about the peripheral cartilage loose bodies. The reaction is completely subacute and is associated with fibrin in the synovial fluid (Figs. 3 and 4).

DIAGNOSIS

The diagnosis of chondromalacia of the patella is not a simple task. The history of the patient is of little help. The physical examination is of little help. Both the history and the physical examination are of little help.



Fig. 1. Gross specimen of a patella with a large, lobulated mass of tissue (chondroma) attached to its superior surface. (Case 1)

in the same joint. One should exercise great care in palpating the articular surface of the patella by displacing it from side to side during the examination. Local tenderness under the patella may be the only positive finding and even this may not be present if the pathological changes are confined to the center of the articular surface. It may be possible to produce pain by pressure upon the joint over the patella with the knee acutely flexed.

Medial joint line. In our series of 11 cases symptoms were precipitated by an indirect trauma of the knee in 5, a direct blow on the patella in 3, whereas in 3 there was no detectable history of injury.

Swelling. Pain was present, either intermittently or continuously, in all cases. Secondary hyperextension of the knee was frequently catching, a sensation of weakness or giving away of the knee and occasional locking of the joint. In both of these cases loose bodies were found at operation.

Patellar motion. On physical examination patellar motion was presented in 6, increased in 6, and restricted in 1. In 10 of the 11 cases there was no lateral deviation of the patella, and in 1 case a epistaxis of the patella as mentioned earlier in the material. In only 4 of these 11



Fig. 2. Gross specimen of a patella with a large, lobulated mass of tissue (chondroma) attached to its superior surface. (Case 2)

tenderness over the mesial articular surface of the patella. It is probable that in some cases this very important sign was not looked for as lightly as it might have been. Tenderness along the mesial knee joint line was recorded in 6 cases. The reason for this finding is not clear. In 2 cases the patella was abnormally mobile laterally.

Therefore given a patient with a history of intermittent pain over the anterior aspect of the knee associated with a momentary sensation of catching followed perhaps by slight stiffness and moderate swelling of the joint with atrophy of the thigh and tenderness along the mesial border of the articular surface of the patella, one should strongly consider the diagnosis of chondromalacia of the patella.

X-ray diagnosis. In all 11 cases roentgenograms of the patella were negative. In 3, however, there was evidence by roentgenograms of osseous loose bodies in the joint, which presumably took origin from the inferior surface of the patella, and in 1 case there was moderate calcification of the tibial collateral ligament.

TREATMENT

The form of treatment to be employed is determined by the severity of the symptoms in the individual case.

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 ll (Ca)

If the symptoms are mild and cause only an occasional disability from the knee even though the diagnosis of chondromalacia of the patella may be reasonably certain operation should not be carried out until the patient has been observed over a period of time and then only if symptoms increase in severity. During this time exercises to maintain strength in the quadriceps muscles should be carried out.

In a patient with moderately severe symptoms with an occasional locking or rather frequent catching in the knee which may be followed by pain swelling and stiffness operation is probably indicated. The knees should be explored through a parapatellar incision and if the area of disintegrated cartilage is of moderate size complete excision of the area should be carried down to bone. Loose cartilaginous bodies should be diligently searched for.

If an extensive area of chondromalacia is found covering essentially the entire surface of the patella or if the area is marked eburnation and thickening of the patella the fourth or final stage of the process one of two operative procedures is indicated: (a) A patellarplasty consisting in horizontal resection of approximately two-thirds of the patella with interposition between the bony surface of the patella and femoral condyle of a flap of fat and synovia turned upward from the infrapatellar region or (b) complete removal of the patella. In all of our cases the changes in the patella found at operation were either moderately severe or extensive.

In 9 instances the degenerated area was removed by a sharp excision down to bone. In all of these there were cartilaginous bodies lying free in the joint which were all removed. In 3 of the 9 some of the loose bodies were calcified. In 1 patient the change was so severe as to warrant patellarplasty. In 2 patients with associated recent lateral slipping of the patella the tibial tubercle in each was transplanted medially. In 1 case was the patella completely removed.

END-RESULTS IN 11 CASES

Six patients were returned to full military duty where they have remained for at least 1 year after operation. Three patients were returned to limited service duty following operation. One has remained at limited service duty for 17 months. The remaining were returned to the United States because of chronic synovitis of the knee after period of duty of from 3 to 5 months. The tibial tubercle was returned to school activities. One was completely healed by operation. The other was definitely improved in that locking of the knee was eliminated but occasional catching of the knee persisted.

It is impossible to know the final disposition of all of the patients as the end results of the treatment cannot be determined until a period of years has elapsed. Therefore all of them should be followed at early intervals to determine whether or not traumatic changes in the joint develop to a sufficient degree to interfere with the normal function.

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 8 S L O F h n d k i f r e M t 9 3 3
 9 S O K F A N E l d J M 9 3 5 3 9 2

CHANGES IN CHRONAXIE DURING DEGENERATION AND REGENERATION OF EXPERIMENTALLY PRODUCED LESIONS OF THE SCIATIC NERVE OF THE CAT

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TO be an effective stimulus for nerve or muscle an electrical current must be of a certain liminal strength and must flow for a certain liminal duration of time

As the duration of the stimulus is shortened so must the strength of the current be increased When one plots the strength of the current necessary to produce contraction of a muscle against the durations of the current a strength duration curve is obtained In general it is difficult to compare the whole of such a curve obtained at one time of degeneration or regeneration with the whole curve obtained at another time It is also difficult to compare a whole strength duration curve obtained from the examination of one person to that of another In part this is due to the fact that the curve bears a certain relationship to the rheobase or the minimal current which will stimulate muscle or nerve at long durations usually over a second and frequently designated as of infinite duration For this as well as other reasons concerned with the kinetics of stimulus it has been found more desirable to compare some point on a curve to a similar point on another curve Such a point is the time constant designated as chronaxie This is the current duration at which the strength of the current necessary to produce contraction of muscle by a current of infinite duration (rheobase) is doubled

Since the early work upon this time constant chronaxie by Lapicque and Lucas many investigators have contributed to its study For the most part the studies have been conducted by physiologists Just as it had been found that muscles which contract and relax slowly have a longer chronaxie and those which contract rapidly have a shorter chronaxie so was it found that when a muscle was denervated and its contraction and relaxation slow its chronaxie increased markedly Although the chronaxie of different

muscles of man each have a somewhat different chronaxie the average chronaxie of the normal muscle is a fraction of a millisecond usually less than 0.5 milliseconds that for the flexor sublimis digitorum for example being 0.00021 second When the muscle is denervated the chronaxie may be increased over 100 times or more

The reason for this is stated by Watts as follows The great increase in the chronaxie observed in human subjects after denervation is due not to any alteration in the time constants of the muscle fibers but merely to the point of incidence of the stimulus shifting from nerve to muscle Since the time constant for nerve is short (0.0003 second or less) and that for muscle is long (0.008 second or more) the chronaxie of the denervated muscle in which no nerve is present will be found to be quite long This marked contrast between the short chronaxie of the normal muscle and the long chronaxie of the denervated muscle has led to the use of determination of chronaxie as a procedure for the diagnosis of the severity of a lesion of nerve and prognosis as to its recovery

Many have reported upon the use of chronaxie determinations in man for diagnosis and prognosis Among them may be mentioned Bourguignon

Modifications based upon the same principles of kinetics of stimulus have likewise been used very widely during World War I such modification was the Lewis Jones method of using a constant strength of voltage to determine the minimal duration at which contraction of muscle occurred

The use of these methods has not found much favor among American neurologists and neurosurgeons This is partly due to the fact that different types of apparatus gave different results that in many cases apparatus was faultily designed that accurate measurements of current and time could not be made by methods employing condenser discharges and largely because of the tedious character of the examination and time necessary

In the literature dealing with the use of chronaxie as a diagnostic and prognostic procedure in

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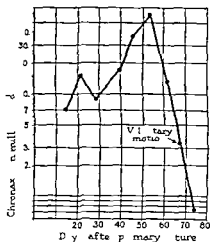


Fig. 1. Chronaxie (in milliseconds) versus Day after primary suture. The curve shows a peak around day 50 and then a sharp decline.

man it is difficult to find reports of measurements performed at regular intervals after injury or suture throughout the period of degeneration denervation and regeneration. Rather there is found one measurement sometimes more of many different cases at different stages of change in muscle. For that reason we do not have a clear understanding of the evolution of changes in chronaxie after denervation and during regeneration. That the enormous lengthening of the chronaxie is a clear indication of denervation cannot be questioned. A number of other questions require an answer. First, what are the changes that indicate recovery? Second, do they antedate re-

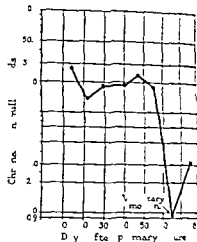


Fig. 2. Chronaxie (in milliseconds) versus Day after primary suture. The curve shows a peak around day 50 and then a sharp decline.

covery of motion or sensation. Third, does the determination of chronaxie give as early and accurate indications of recovery as other methods?

To answer these questions we sectioned a sciatic nerve and immediately sutured the sciatic nerve of a cat. A regular and frequent interval is the muscles supplied by the injured and later regenerated nerve were stimulated by square wave currents of varying durations and strength. Duration curves plotted. A study of the evolution of the changes in chronaxie was made possible and these changes were compared to strength duration curves obtained from the evoked contraction of the recovering muscle in man. As a result of this study certain conclusions will be made.

METHOD

The method for obtaining an impulse of rectangular wave shape lasting for a little as 0.001 microseconds has been described by us before (5). The duration of the impulse as controlled by two gas-filled triodes one of which served to initiate the flow of current while the second served to stop it. A constant flow of current through the tissue was maintained by a pentode operated on the saturated portion of its characteristic. Three different time intervals selected to conform to a logarithmic scale were made available. The indifferent electrode placed over the heel measured 15 centimeters; the electrode 4 centimeters was placed over the belly of the muscle. The rheobase was determined by finding the threshold value of current when the impulse lasted 1 second. Then threshold values of current were found for successively shorter durations of the

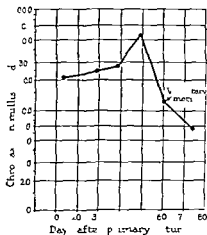


Fig. 3. Chronaxie (in milliseconds) versus Day after primary suture. The curve shows a peak around day 50 and then a sharp decline.

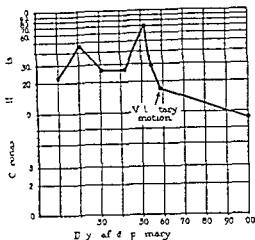


Fig 4 Th l t f ha ge ch na fth gas
t oc em us muscl t d ys fll g p um ry
t re fth soat

impulse. It was possible to use as much time as was necessary to observe the amperage in a suitable milliammeter by shunting the specimen out of the circuit thereby avoiding painful unbearable stimuli and severe polarization changes.

RESULTS

Our first examination was made usually from the 6th to the 14th day after the primary suture. Then examinations were made from 5 to 7 days apart until motor function had well recovered. In all of the gastrocnemius muscles of the 5 cats at the 9th, 10th, 13th, 14th and 5th day the chronaxie had lengthened from a fraction of a millisecond to 21, 34, 21, 27 and 7 millisecond (Fig 1, 2, 3 and 4). In 4 of the 5 animals the chronaxie continued to lengthen somewhat from 2 milliseconds at the 9th day to 47 milliseconds at the 21st day, from 34 millisecond at the 10th day to 35 milliseconds at the 13th day, from 21 milliseconds at the 14th day to 24 milliseconds at the 27th day and from 7 millisecond at the 5th day to 15 milliseconds at the 21st day.

Then in 4 of the 5 animals the shortening of the chronaxie from 47 milliseconds at the 21st day to 26 milliseconds at the 31st day, from 35 milliseconds at the 13th day to 11 milliseconds at the 27th day, from 27 milliseconds at the 14th day to 13 milliseconds at the 21st day and from 15 milliseconds at the 5th day to 8 milliseconds at the 27th day.

This shortening in chronaxie at times to one half of that present before is of course not an indication of recovery. That a higher degree of recovery occurs at this time during the state of

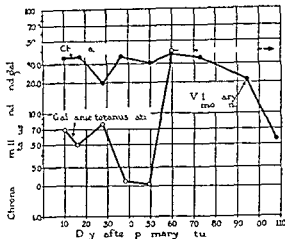


Fig 5 G ph f h g h d t t
rat f th g t oc m n scl at ry g d ys ft
prim y t f th t c
g t d l y d by m f m t

degeneration of the muscle should be emphasized and remembered. The shortening of chronaxie occurs about the same time as we have found a temporary rise in the rheobase in threshold and ratio for progressive current stimuli and three hold and ratio for galvanic tetanus to occur. The cause for these changes is as yet unknown (Fig 5).

Following this there is a progressive lengthening of chronaxie to a peak which is reached at the 49th, 49th, 53rd, 53rd and 60th days with a chronaxie of 56 milliseconds, 23 milliseconds, 60 milliseconds, 72 milliseconds and 38 milliseconds respectively.

Once the peak of the lengthened chronaxie had been reached and as the result of regeneration began and continued to shorten the shortening process was rapid and of a considerable order. The answer to the question as to whether such a rapid and significant shortening of chronaxie occurred before signs of recovery of motion had occurred or earlier than signs detected by other methods of electrical examination was made possible by delayed recovery in one of the cats. The delay was found to be due to a large neuroma when the operative site was explored because motor function had not occurred at the expected time.

In this case the chronaxie had lengthened to 34 milliseconds on the 10th day after primary suture. On the 17th day it was 35 milliseconds and then it shortened to 20 milliseconds on the 27th day. On the 37th day it had again lengthened to 35 milliseconds and continued between 31 and 37 milliseconds to the 72nd day. On the 93rd day it shortened to 20 milliseconds and on the 108th day only was there a sharp shortening to 5.6 mill

seconds. Even if the lesser degree of shortening of the chronaxie at the 93d day be taken as an indication of recovery, it can be seen from Figure 5 that at the 60th day the large galvanic tetanus ratio predicted recovery which was confirmed by return of active motion on the 108th day. Thus the large increase of galvanic tetanus ratio predicting recovery preceded the lesser degree of shortening of the chronaxie by 33 days and the significant shortening by 48 days (Fig. 5).

In man we have also found that the increase of threshold for galvanic tetanus and of tetanus ratio as well as the increase of threshold for progressive current and progressive current ratio indicating successful regeneration of a nerve preceded the significant shortening of chronaxie indicative of recovery.

We have already called attention to the fact that discontinuities in the strength duration curves which are indicative of regeneration of a nerve may be seen during the time that chronaxie may continue to lengthen and seem to give indication of continuation of the degeneration of the muscle. In a group of spontaneously recovering peripheral nerve injuries in man the number of instances in which the chronaxie had significantly shortened (15 milliseconds or less) was about the same as those in which the galvanic tetanus ratio was high. However at times the galvanic tetanus ratio was low and the chronaxie short. At other times the chronaxie was long and the galvanic tetanus ratio high. When evidence of some denervated muscle was obtained by a low galvanic tetanus ratio and in the same muscle evidence of some neurotized muscle was shown by a short chronaxie the combination gave excellent indication of a spontaneously recovering nerve.

When however a nerve had been operated upon a considerable time before electrical examination was made whether motor or sensation had recovered or not the number of instances of high galvanic tetanus ratio exceeded those in which chronaxie had shortened. Nevertheless in some a low galvanic tetanus ratio and a short chronaxie indicated recovery.

It is obvious therefore that it is of value to measure the chronaxie as well as the galvanic tetanus ratio.

SUMMARY

The marked lengthening of chronaxie from that of a fraction of a millisecond in normal muscle to one of 100 or more times is indicative of a denervated muscle. After the initial marked lengthening

of chronaxie following section and suture of a nerve the temporary shortening of chronaxie which occurs at about the 26th day must be interpreted as a sign of recovery. It is a phenomenon which occurs at a time when other changes in characteristics of responses to electrical stimuli usually seen at recovery also appear for a short time. These are the increase in rheobase, increase in threshold for galvanic tetanus and of tetanus ratio, increase of threshold for progressive current stimuli and progressive current ratio. The cause of this is unknown. When one then follows the evolution of changes in chronaxie it is found that a significant shortening of chronaxie is associated with recovery. However when recovery is delayed this occurs much later than other indications of recovery derived from other methods of electrodiagnosis. Even when not delayed when regeneration of a nerve is progressing other signs precede shortening of chronaxie as an indication of recovery. However the combination of a low galvanic tetanus ratio with a short chronaxie is characteristic of spontaneously recovering lesions and at times of recovery after operations upon injured nerves.

CONCLUSIONS

1. The marked lengthening of chronaxie from that of a fraction of a millisecond to that 100 or more times longer is a clear indication of denervated muscle.
2. The temporary shortening of chronaxie during the course of degeneration of muscle is not a sign of recovery.
3. Significantly great shortening of chronaxie from its final peak of great length is a sign of recovery.
4. This sign of recovery occurs later than signs derived from other electrical examinations such as tetanus ratio and may not occur until the time of recovery is present.
5. The combination of a low galvanic tetanus ratio with a short chronaxie is characteristic of spontaneously recovering lesions and at times of recovery after operations upon injured nerves.

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EXPERIMENTAL CHOLECYSTITIS

Final Results of Vaccine and Filtrate Therapy

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In a tabular review of the literature on cholecystitis (2) the bacterial studies on 2162 diseased gall bladders removed at operation seemed to indicate that the organisms most frequently present were streptococci similar to those infecting the nose, throat, teeth, and bowel, the *Staphylococcus aureus* as in sinus disease, and members of the typhoid colon group. Our experiments conducted over a 15 year period were carried out with over one hundred antigens obtained from patients in the Jefferson Hospital. In the first series in which 16 strains of different types of organisms were injected into 88 rabbits, some degree of chronic cholecystitis was produced with organisms from each group, the most effective being a nonhemolytic streptococcus isolated from the bowel of a patient suffering from chronic cholecystitis and colitis. Inoculation of 66 of the 88 rabbits with the nonhemolytic streptococcus caused gall bladder disease in 13 (20 per cent). In a later communication (1) on the use of various bacterial organisms it is reported that 44 strains of 7 different types of organisms were used in 129 rabbits, resulting in 25 diseased gall bladders (approximately 20 per cent).

Ascending doses were injected intravenously into the rabbits' ears, usually beginning with 0.02 cubic centimeter of 6 hour culture, and repeated in larger doses once or twice a week, dependent upon signs of morbidity in the animal. Frequently injections were discontinued after the third or fourth small dose, but in other cases the dose amounted to 3 cubic centimeters of a 24 hour culture. Realizing that in some cases we had used too large amounts of the antigen, which tended to produce acute rather than chronic cholecystitis, we decided to modify the technique.

While aware of the virtual impossibility of duplicating in the experiment 1 animal focal infection as it may exist in man, nevertheless we hoped to simulate this condition as closely as possible. Therefore small intravenous injections of 0.02 to 0.05 cubic centimeter of an 18 to 24 hour culture were repeated twice a week, unless contraindicated by the condition of the rabbit (1). One

hundred sixty six animals were injected with the viable strain of *Streptococcus nonhemolyticus* (antigen 7) until presumably chronic illness was clinically evident. Eighty four diseased gall bladders (51 per cent) were obtained.

The animals were then segregated into groups of 3 individuals: control, vaccine treated, and filtrate treated, the selections being based on similarity of response to the culture inoculation—the temperature and weight changes and presence of joint disease. (With the nonhemolytic streptococcus we have observed a high incidence of joint disease associated with gall bladder lesions.) When it was impossible to select 3 animals with similar manifestations, those in the poorest condition were placed in the control group. On this basis 59 were retained as controls, 50 were inoculated with vaccine, and 57 were treated with filtrate.

These series were further subdivided according to the nature of the dietary regimen (adequate in some cases and inadequate in others) and the results obtained led us to believe that the animals on an inadequate diet responded less favorably to treatment than did those which were adequately fed. Furthermore, the treatment with autogenous vaccine apparently yielded more satisfactory results than did treatment with the filtrate.

Since then we have employed the same method of experimentation on a further series of 224 animals, with this exception: After completion of the infective phase, the animals were arbitrarily selected for grouping as follows—*trial 1*, the rabbit apparently in the best physical condition was placed among the controls, and that in the poorest among the vaccine treated; *trial 2*, the poorest animal was placed among the controls, and the best in the vaccine treated; *trial 3*, the healthiest animal was selected for the filtrate treated group, the poorest for the controls. Employing this procedure for each selection of 3, the best and poorest animals were evenly distributed throughout the 3 groups. In this way we felt we had avoided prejudice in the selection of animals for treatment.

We shall present here a detailed interpretation of the data obtained by gross studies at necropsy on the 224 animals (4 control, 75 vaccine treated, and 75 filtrate treated) that lived, maintained on an adequate diet throughout the planned term of

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TABLE I — GROSS PATHOLOGY ASSOCIATED WITH GALL BLADDER DISEASE

SERIES OF 24 ANIMALS				ANTIGEN 7	
				Number of	Percent
Gall bladder lesions grossly	3			68.3	
Gall bladder diseased bil	36			34.4	
Gall bladder diseased bil	67			9.9	
Gall bladder diseased					
disease					
Gall bladder diseased	8			8	
kidney lesions					
Gall bladder diseased				9.4	
joint lesions					
Gall bladder diseased with	5			4.6	
gynecological	9			6.3	

treatment. The 11 controls 6 were not treated and 14 filtrate treated rabbits, which either died or were killed to prevent postmortem change when death seemed imminent, are not included in this report because autopsies disclosed that they suffered for the most part from an acute bacterial infection. The fact that so few animals died after initiation of the treatment phase of the experiment is perhaps indicative of our success in selecting the chronic cases on the basis of clinical evidence.

Microscopic studies on this series will be reported later. Nine normal animals selected from the same stock showed no evidence of gross or microscopic change at necropsy.

Table I summarizes the gross pathological findings on the gall bladder observed at necropsy on the 4 animals. It is to be noted that approximately one third of those with cholelithic disease showed coexistent kidney and joint infection. Elsewhere we shall present the studies on associated lesions.

Table II gives general findings on bacteriological study of cultures recovered during necropsy.

Only 37 or 16.5 per cent of the animals had an active infection and in only 20 or 8.9 per cent was the viable *Streptococcus nonhemolyticus* present in the bile. At first glance it may be thought that the recovery of the organism from the joints closely parallels that from the bile. However, it must be borne in mind that only 13 rabbits 5.8 per cent disclosed some active infection of the joints on necropsy. The remaining 3 joint cultures were from rabbits having multiple joint infection. It is apparent therefore that in both gall bladder lesions and coexistent joint and kidney lesions the organs were frequently sterile.

FURTHER DATA ON CULTURE INJECTION — VIBRIANT ORGANISM — 24 ANIMALS

In the control group with adequate diet the average 74 animals. The total number of injections

TABLE II — POSITIVE CULTURE RECOVERY

Animal	Th	It	Es	Ver	Per
Tal	pos	it		37	55
Bil	cult	es	f	5	24.5
J	cult	f	m	20	5
Kidney		It	es	6	7
Oth	so	It	es	9	45

given was 1301, the average injections number 18. The period of injections covered a minimum of 3 days to a maximum of 8 months. The range of injections was 1 to 58.

In the vaccine treated group with adequate diet there were 75 animals with an average number of injections of 18. The total number of injections was 1357. The time range of injections in the series varied from 3 days to 71 months. The range of number of injections was 1 to 52.

In the filtrate treated group with adequate diet there were 5 animals with an average number of injections of 19. The total number of injections was 130. The time range of injections (when more than 1 was given) varied from 3 days to 9 months. The range of number of injections was 1 to 60.

DURATION OF CONTROL PERIOD

Of 74 animals 48 were controls for 3 months, 14 were controls from 2 to 2 1/2 months, 5 were control from 3 to 5 months, 7 were control for 9 months.

In only 2, 8.9 per cent of the 224 animals injected with the viable antigen was the organism recovered from the bile. It is therefore apparent that some time after the period of administration recovery of the organism was relatively infrequent.

After preliminary injection of the viable organism and an appropriate rest period the second group was submitted to vaccine treatment as follows:

1. Vaccine Treatment

Adequate Diet Planned Period — 224 animals. In the group of 35 rabbits receiving small doses, 9 received 26 or 27 treatments to receive 17 to 25 treatments, 6 received 28 to 35 treatments. Twenty-three were treated over a period of 3 months, 9 were treated from 2 to 3 months. These 32 were treated 3 to 4 months. The number of killed organisms given was as follows: 19 received single doses of 30,000 or 135,000 killed organisms, 9 received single doses of 33,000 to 57,000 killed organisms, 3 received single doses of 120,000 or 125,000 killed organisms, 4 received single doses of 140,000 to 189,000 killed organisms. A general average of 100,000 organisms per treatment was given.

TABLE III—SUMMARY OF INCIDENCE OF CHOLECYSTITIS AND COEXISTENT LESIONS

Gross autopsy findings (percentage) if term adequate diet	Control				Vaccines				Filtrate			
	14 animals				5 animals				75 animals			
	Lesions		Postul		Lesions		Postul		Lesions		Postul	
	N	%	N	%	N	%	N	%	N	%	N	%
Gall bladder lesions gross	5	68.8		5			5	67	54	72	8	—
Gall bladder lesions questionable	3	4	—	—			—	—	6	8	—	—
Gall bladder lesions positive	4	4		5	3	44	5	67	4	6		
Abnormal bile to 1	1		—	—		53	—	—	26	37	—	—
Abnormal bile questionable		68	—	—		3	—	—	5	67	—	—
Abnormal bile positive		57	—	—			—	—	4	—	—	—
Normal bile with gross lesions	3			—				—	3	—	—	—
Normal bile with positive all bile die		3	—	—				—	33	—	—	—
Coexistent disease	5	68			5			—				—
Gall bladder disease questionable	—	—	—	—				—	—	—	—	—
Coexistent disease positive	5	68						—				—
Coexistent kidney lesions					8			—	6	8		—
Questionable gall bladder lesions	—	—	—	—				—	—	—	—	—
Positive gall bladder lesions					53			—				—
Questionable gall bladder lesions								—				—
Positive gall bladder lesions	8		—	—	6			—	3	20	—	—
Coexistent kidney lesions	8				20		20					67
Questionable gall bladder lesions			—	—			6	—			—	—
Positive gall bladder lesions								—	6			6

In the group of 40 rabbits receiving *large o ascend* dosage 19 received either 26 or 27 doses 7 received 14 to 17 doses 6 received 3 to 25 doses 6 received 28 or 29 doses received 43 or 46 doses or a general average of 26 doses. Twenty-eight received treatment for 3 months 8 received treatment from 2 to 23 months 4 received treatment for 4 to 6 months. The number of killed organisms given was as follows: 18 received from 116,000 to 470,000 killed organisms 6 received from 500,000 to 685,000 killed organisms received 1,358,000 or 2,312,000 killed organisms or a general average of 5,600 killed organisms per dose.

The third group was submitted to alternate treatment as follows:

Filtrate Treatment
224 animals

In the group of 40 rabbits given *normal dosage* 5 received 27 to 30 doses 13 received 12 to 15 doses 12 received 12 to 21 doses. Twelve received treatment for 3 months 6 received treatment for 1 to 21 months 4 received treatment for 3 months. The amount of filtrate given was 3 received from 5 to 35 cubic centimeters

11 received 60 to 105 cubic centimeters 6 received 140 or 145 cubic centimeters.

In the group of 35 rabbits given *large o ascend* dosage 19 received 26 or 27 treatments 11 received 14 to 25 treatments 4 received 28 or 29 treatments and 1 received 43 treatments. Twenty-six received treatment for 3 months 8 received treatment for 2 to 2 months 1 received treatment for 5 months. The amount of filtrate given was as follows: 14 received from 275 to 390 cubic centimeters 13 received from 405 to 485 cubic centimeters 7 received from 530 to 565 cubic centimeters and 1 received 1446 cubic centimeters.

TABLE IV—GRADES OF GROSS GALL BLADDER LESIONS OBSERVED

Grade	Control		Vaccines		Filtrate	
	N	%	N	%	N	%
Plus-minus	3	75	7	—	29	—
Plus	3	—	8	20	—	—
Plus	20	—	7	—	29	—
Plus						

TABLE V.—INCIDENCE OF CHOLECYSTITIS WITH COEXISTENT LESIONS

Gall bl les Gall bl les Gall bl les Abn m (bl) Ab rm (bl) Abnormal bl	pos ts)	full	d rm	les d qua	x- d du	V								Filtr							
						small dose 3 nimal				Acce di d imal				small dose 1				Acce di d imal			
						Le		Pos bl cul		Le		Pos bl cul		Le		Pos bl cul		Le		Pos bl cul	
						N	C	N	C	N	C	N	C	N	C	N	C	N	C	N	C
Gall bl dd	les	ns	oe	l		6	7	—	6	6	—	—	—	80	3	—	—	6	7	8	1
Gall bl dd	les	ns	oues	bl		—	—	3	8.6	—	—	—	—	7	3	7	—	20	5	5	4.1
Abn m (bl)	l					8	8	—	—	5	—	—	—	—	—	—	—	—	—	—	—
Ab rm (bl)	l	oe	bl			8	—	—	—	5	—	—	—	—	—	—	—	—	—	—	—
Abnormal bl	pos					—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N rmal bl	wi	h	es	bl	ll bladd	8	8	—	—	—	—	—	—	3	—	—	—	5	—	—	—
N rm l bl	h	pos	ll bladd			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N dise se oe	wi	h	ll bl dd			—	—	—	—	5	—	—	—	—	—	—	—	3	6	—	—
N dise se coe	h	bl				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
N d sease coe	wi	h	pos	ll		—	—	—	—	—	—	—	—	6	—	—	—	7	—	—	—
N d sease coe	bl	dd				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coe	k	dn	l			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ques	bl	gall	bladd	wi	h	pos	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pos	ll bl dd	wi	h	pos	k dn	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coe	les	ll bl dd	h	pos		5	—	—	—	—	—	—	—	—	—	—	—	8	8	—	—
Ques	bl	ll bl dd	h	pos		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pos	gall bl dd	wi	h	pos	jo	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—
Coe	jo	d	ni	ns	d	8	—	—	—	—	—	—	—	5	3	5	—	5	8	—	—
Question	bl	gall bl dd	wi	h	d	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pos	ani	gall bladd	wi	h	jo	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
mi	l					—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

To ascertain the effect of treatment upon the pathologic picture the data used to compare Table I were appropriately distributed among the respective groups of 4 control 75 vaccine treated and 75 filtrate treated animals (Table III).

Necropsy of many hundred of healthy rabbits killed to obtain material for physiological and chemical studies has given us an undeliberate picture of the healthy gall bladder in the rabbit. Likewise our experience with the experimental production of cholecystitis has taught us how to recognize grossly an unmistakably pathologic gall bladder. However on some occasions during these experiments necropsy revealed gall bladders that were not definitely pathologic yet on the basis of our experience with normal gall bladders we were not justified in considering them negative. There were deviations from the normal but the changes were too slight to characterize the organs as definitely diseased. In such cases we decided to record the observations as plus-minus that is the condition was intermediate between the normal and that clearly having low grade pathology. Study of Table III discloses that the questionable plus-minus gall bladders furnish the crucial data when we seek to determine the efficacy of treatment in reducing the incidence of cholecys-

titis. If we consider the plus minus lesions as belonging to the positive group then the incidence of disease among the controls is 69 per cent in the vaccine treated animals 64 per cent and in the filtrate treated 2 per cent. These differences in frequency are too small to be of any orthogonality. On the other hand if the plus-minus gall bladder lesions are not considered then the occurrence of definitely positive gall bladder lesions in the control group is 63 per cent while for the autogenous vaccine treated group it is 44 per cent and for the filtrate treated group 64 per cent.

Vaccine treatment therefore presumably lowered the incidence of gall bladder disease by 21 per cent.

In regard to this difference it is interesting to note that 20 per cent of the vaccine treated animals exhibited doubtful or plus minus gall bladder disease while only 4 per cent of the controls and 8 per cent of the filtrate treated animals had plus-minus gall bladder lesions. It is a question whether the observation of doubtful changes at the termination of treatment signifies that these lesions were in a state of involution or that a low grade infection was persistent throughout the period of experimentation. In view of the low percentage of doubtful gall bladder lesions among

TABLE VI—RELATION OF GRADE OF GALL-BLADDER LESION TO METHODS OF TREATMENT

Grade of lesion	Vaccine				Filtrate			
	Repeated small doses 3 animals		Ascending doses animal		Repeated small doses animal		Ascending doses 3 animals	
	N	%	N	%	N	%	N	%
Negative		3	5	3.5	8		3	3
Plus 1		7	6		4			5.7
Plus 2		8		5		3.7	7	20
Plus 3	6			20		3		3.4
Plus 4				5		5		5.7
Total doubtful				4.5			20	5.7
Total of all plus minus	3		6		80			6

the controls we feel that the evidence points more strongly to the assumption that these were in process of involution.

Failure with the filtrate treatment may be ascribed either to inadequate dosage or to inability of the viable organism to elaborate a potent exotoxin.

Table IV is a frequency distribution of the various grades of gall bladder disease observed in the 3 groups (control vaccine treated and filtrate treated animals).

Comparison of the control and vaccine treated groups discloses (1) that there were 5 per cent more negative gall bladders in the vaccine group (2) there were 12.4 per cent fewer mildly positive (plus 1) gall bladder lesions in the vaccine group (3) there were 5.6 per cent fewer moderately severe (plus 2) gall bladder lesions in the vaccine group. The incidence of severe (plus 3) gall bladder lesions were too few to lend themselves readily to interpretation. Yet if one adds the 5 per cent difference in the incidence of negative gall bladders in the control and vaccine groups to the 16 per cent difference in the doubtful lesions for the control and vaccine groups the resulting sum equals the sum of the respective differences in plus 1 plus 2 and plus 3 lesions of the control and vaccine treated gall bladders e.g. in the negative group there was a difference in percentages of control and vaccine of 5 per cent in the plus-minus group of 16 per cent of a total in these groups of 21 per cent. In the plus 1 group the difference was 12.4 per cent in the plus 2 group the difference was 5.6 per cent in the plus 3 group the difference was 2.7 per cent or a total of 20.7 per cent in the latter 3 groups.

Repeated small doses and ascending doses were employed in order to evaluate the merits of the two methods of treatment. The data obtained with the respective groups after the small and

the ascending doses were used are presented in Table V. Here again evaluation of the improvement in the gall bladder lesion depends upon what significance is to be placed upon the doubtful lesions.

The frequency of the respective grades of gall bladder lesion in relation to the mode of dosage with vaccine or filtrate is presented in Table VI an extension of Table IV.

The total positive culture recovery of the control vaccine treated and filtrate treated groups is given in Table VII.

In Table VIII the incidence of various grades of gross gall bladder lesions observed at necropsy is compared with the number of injections of viable antigen 7 (*Streptococcus nonhemolyticus*) given during the infective phase of the experiment.

The question may be raised as to whether the number of injections (amount of viable culture) given eventually determines the degree of gall bladder lesion produced. To ascertain accurately the effect of a number of injections an equal num-

TABLE VII—TOTAL POSITIVE CULTURE RECOVERY

Source	Control		Vaccine		Filtrate	
	N	%	N	%	N	%
Animals with positive culture	5	20	8		4	5.7
Gall bladder wall only		5		6.7		7
Bile	6					
Liver		8		7		
Kidney						
Urin						
Cystic material						
Total positive culture						

EDITORIALS

SURGERY Gynecology and Obstetrics

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D A L F C B A L O U R I I E d i t o r a t S t f f

OCTOBER 1945

MISUSE OF MORPHINE AS A THERAPEUTIC AGENT

I N anybody's list of the drugs that are most useful in medicine morphine would be placed near the top. Misuse of the agent that may have occurred in military medicine only points to a similar although perhaps less noticeable abuse in private practice for military medicine during wartime represents a cross section of civilian medicine. Both pharmacologists and clinicians say that the misuse of morphine is not to be placed at their respective doors. Where the responsibility lies for the unwise employment of this agent is less important than the fact. It is to be recognized too that here is one more example of the regrettable state into which the teaching of therapeutics has fallen. The situation is a paradoxical one in that medical school and hospital whose aim is to provide a background which will permit the student to understand the treatment of disease often fail to accomplish this reasonable end. At least they fail have failed in the present in

stance to ensure the sensible use of this most important agent.

Aside from the fact that adequate teaching of therapeutics does not exist in many medical centers the causes of morphine overdosage (for its misuse is chiefly that) are several.

There is failure to appreciate that nearly the safe maximum analgetic effect of morphine can be produced by 15 milligrams (gr $\frac{3}{4}$) and that 30 milligrams (gr $\frac{1}{2}$) can produce serious depression in small individuals or in any individuals whose tolerance may have been lessened by wounds particularly those associated with hemorrhage or pneumothorax or other disability that limits the intake and distribution of oxygen. In civil life everybody practically knows that morphine is contraindicated in hypothyroidism and is dangerous in obstetrics. Too few know that impaired liver function increases the danger that an otherwise modest dose may become an overdose in a given case.

Failure to realize that subcutaneous injections of morphine will be only poorly absorbed if at all when the peripheral circulation is sluggish or inactive as a result of cold or low systemic blood pressure has led to rather frequent trouble. Failure to get pain relief from the unabsorbed morphine leads to the administration of a second or third dose all of which may be absorbed at one time when the peripheral circulation is reestablished as a result of resuscitative measures.

The incorrect belief that extensive wounds are inevitably associated with severe pain often leads to needless use of morphine. At Anzio only a quarter of the severely wounded patients said in response to a direct question

that they were having enough pain to want pain relief medication. This was in one of the most forward hospitals and these patients had not had morphine for seven hours on the average.

The administration of morphine for conditions that will not respond satisfactorily to the agent, however large the dose, is a common error. Specifically, the use of morphine to treat the restlessness associated with bleeding with anoxia or with hysteria cannot be soundly defended. The use of morphine in shock, except for the treatment of severe pain, is contraindicated; it produces sweating, it causes nausea and vomiting. Thus it not only increases fluid loss but makes the intake of fluids by mouth and their retention often impossible.

Morphine is occasionally administered where other agents (barbiturate sedation, for example) are far better, as in the treatment of nervousness, the jitters, sleeplessness. Individuals with these problems are of course likely candidates for addiction. The use of morphine as a routine in preanesthetic medication is difficult to justify, for there is reason to believe that the patient pays too high a price for the depression obtained by means of this agent, and that the effect desired could be achieved better in other ways.

The evidence is mounting that morphine has a single legitimate use, the relief of severe pain—a widely accepted view, but one too little put into practice.

HENRY K. BEECHER

Consultant Anesthetist
Medical Department of Resecting
Throat and Operative

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The subject matter is divided into six sections. The esophagus, the upper gastrointestinal tract, the biliary tract, the colon, the rectum, and the sigmoid colon. The first part of the book is devoted to the anatomy and physiology of the gastrointestinal tract. The second part is devoted to the pathology of the gastrointestinal tract. The third part is devoted to the diagnosis of the gastrointestinal tract. The fourth part is devoted to the treatment of the gastrointestinal tract. The fifth part is devoted to the prevention of the gastrointestinal tract. The sixth part is devoted to the prognosis of the gastrointestinal tract.

The arrangement of placing the descriptive and legends on the left hand page and the illustrations on the opposite side facilitate study. The illustrations are numerous, well chosen and are grouped in such a manner that several illustrative roentgenograms of the same patient appear side by side. All of the 604 illustrations are in the negative phase and excellently reproduced. A short bibliography appears at the end of each section and an adequate index is appended.

The author and publishers have succeeded admirably in the production of an excellent handbook. It is a compact and concise surprisingly comprehensive work of its size and can be highly recommended to students, roentgenologists, gastroenterologists and to any physician with an interest in the diagnosis of the diseases of the gastrointestinal tract. E. M. E. BARTH

THE very excellent book *The Art of Resuscitation* by Paluel J. Flagg treats in a most complete fashion the subject of resuscitation. The two divisions written by Chas. E. Jackson. The beginning chapters treat the growth of the art of resuscitation from the history of anatomy and physiology through the efforts of organizing a society for the prevention of asphyxial death to its present status. Asphyxia is next treated as a general problem. The experimental physiology involved is accurately and well defined. The principles of resuscitation are set forth with clarity and simplicity with the correct stress on indication for treatment and types of treatment. The methods for resuscitation are merited with emphasis on intratracheal insufflation. A chapter is devoted to the transportation of the unconscious patient. The author describes in detail the reconstruction of a commercial millburn to take care of the unconscious patient prior to succumb to carbon monoxide poisoning from submergence in the carbon monoxide. The detailed part of his book to a careful thorough discussion of asphyxia as a specific problem in the newborn from high altitudes for carbon monoxide poisoning from submergence in the carbon monoxide. It is in electrical in cases of neonatal asphyxia fighting and mechanical but the therapeutic ratio from the pathologic obstetric respiration and from clinical data. Each part of the book is amply illustrated. The unfolded with the expectation to satisfy a man with Dr. Flagg's vision and experience could hardly be.

In both sections the committee of asphyxia and the American Medical Association numerates the

[illegible]

in which immediate attention is needed. A method is outlined of attacking the problem by publication elsewhere a departmental instruction of physicians. Emphasis is made on the role of the United States Public Health Service: first, a definite. The important phases of a physical examination brought up to date by the guidance of the American Public Health Service. A adequate discussion of the medical aspects of its relation to asphyxia treated by the department of public health service. All other subjects connected with thoracic diseases include physical diagnosis and differential diagnosis and sanitation of the patient of public health service. All forms of gas the patient is noted.

The purpose of this book is an entirely practical one. It is a attempt based upon more than 5 years of intimate personal work with the unconscious patient to tell the reader what to do when faced by a critically ill patient about to die. The book is complete treatment of the subject treated in every phase connected with a physical examination with tell the end. It will fill the much needed place in the library of the professional physician. M. V. KARP.

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the decrease of the shoulder. The monograph *S4 / d / Le* contains an up-to-date concept of the pathologic in the shoulder region in the extremities. 81 pages.

The subject presented haptas hichma be read independently making for ready reference. The type composition is excellent in the design of the advertisement of the book. The book covers ruptures of the thoracic cuff of the calcified deposit perithoracic hichma syndrome, raydag, saddle time, peritretment and to the shoulder function. On part of the treatment of the chest on the leg of the patient of shoulder pain. D. F. L. McNaughton.

The discussion of fish liver oils and emulsions, much too brief, and the whole is much fitted to the end.

On the whole, the book by Dr. Mooley presents the subject of fish liver oils in a concise and brief form while a detailed account of the detailed points of pathology is added.

WILL M. A. LA M.

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CORRESPONDENCE

DICUMAROL THERAPY IN POSTOPERATIVE THROMBOPHLEBITIS AND PHLEBOTHROMBOSIS—

A Correction

OPPORTUNITY has been given me by the Editors of SURGERY GYNECOLOGY AND OBSTETRICS to correct statements in the March 1951 issue.

My article entitled "Dicumarol Therapy in Postoperative Thrombophlebitis and Phlebotomy" which appeared in the July 1951 issue. These statements in the July 1951 issue should be filled. The policy to use 3 seconds as a basis for standardizing the procedure for the time of the drug is not a standard. The drug is not a standard. W. LAR. H. P. so

October, 1945

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DAVID H. IVY, M.D. Detroit, Michigan

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SURGERY OF THE NERVOUS SYSTEM

Peripheral Nerves

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R. pai. of. P. n. ph. r. al. N. r. v. i. j. n. a.

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Brain and Its Covering Cranial Nerves

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LUN. G. J. d. Anson. A. W. L. pom. f. th. B.
R. po. t. f. C.

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Spinal Cord and Its Covering

SOULE. A. B. G. oss. S. W. d. IRVIN. J. G. Mye.
l. g. phy. by. th. U. f. Pant. pag. in. th. D. g.
f. f. r. u. t. a. f. th. I. t. r. v. t. bral. D.

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DAVIS. J. H. MORRO. W. J. nd. TOOMEY. J. A.
R. lt. th. T. tm. t. f. Meni. ocoen.
M. g. th. \ ntut. x. n. d. S. f. nam. d.
Drug.

9

WINT. S. J. Th. T. tm. t. f. M. ningococ. c.
M. n. g. th. Childre. w. th. S. gl. I. t.
Dose. f. bod. um. Sul. di.

8

ZIE. L. H. d. OSCOOD. C. W. Ldema. d.
T. oph. e. D. tu. b. es. f. th. Lowe. E. t. m. tes.
C. m. p. l. cating. P. fr. tal. Lobot. my.

8

BR. D. W. W. d. S. rro. J. B. A. P. sacral.
Cyst. App. ntly. An. ng. f. m. th. N. ure. ten.
Ca. l. n. Newborn. Inf. t.

83

S. K. a. d. Opom. G. L. M. rph. l. gical. Alter.
t. f. th. N. D. t. T. m. In. asu.

83

SURGERY OF THE THORAX

Chest Wall and Breast

WA. LE. C. I. G. Du. t. P. p. l. m. f. th. Breast.
R. tr. \ d. W. LSON. K. Os. ou. Ca. tilag.
ous. nd. Mixed. T. m. rs. f. th. H. man. Breast.
A. R. w. f. th. Lit. i.

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- LAIPPY T C Cysts and Cystic Tum rs f th
Mediastinum
- Mediastinum**
- MA cellane us
- S VA E O Pulm nary Concussio (Blast) n
N tho ci B tcl W unds
- SURGERY OF THE ABDOMEN**
- Th R latu ship f Chroni Lesi ns to Carcin ma
f th Col —Chroni Ulcerati C ltitis Col
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Eff t Gastr Secret f Pedi led f jun l
Grafts in th Wall f th St m ch
- MARKS LL S F A Plan f th Surgical M ge
m t f Gast) oc li F btl
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rtz R F A Synth tic P edigest d Ailm nt f
J l ost my Feedi 3 3
- M RGA C N W unds f the Col 3 3
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- CASHMAN B Z Hyst t my th P s u f
O rt Tiss th T tm t f E dem tno-
si 3
- M J V Th W th m Operati f C ci
m f th C rux 3
- M ER W F d S O R T tal Abdmnal
Hyst ect my 3
- Adn xal and P n terin C diti
- WY RY J Th Effect f Testost P p nat
Cases f O rian Ca cin ma 3
- PARKS T J Ca cin m f th Ovary f t d P
operatively with De p X ray 3

External G tala

B ADV L M thod IC t tunga v g a
 Wharto L R Spota co s P r f rati f th
 Rect g l Sept m F Week fte Co
 truct fth v g

OBSTETRICS

Pr gn cy dlt C mplicatio s

Mt ey R D R d L M d D y L W
 P gn cy fll g Mly mect my

A z R E GOLDMA D W d B tucc
 F J l t D f c s P eg cy

QTCLE J K H b t al Aba tu
 Scott W A S me IC mplicat D n g P g
 cy d L bo

H A T N S d k TSC ME H L Pyel tus f
 P gna cy

L b and It C mplicatio s

Lv ch f J R pt fth Ut
 l r N G E i c H W d B own J B
 Ob r t B h D l G l

Hosp tal

N wborn

WA L W W J d Wm HEAD B W
 N t l M raly R t I f t I g
 P phylact D ses f v tam K

R T L S R Bla m M d LESLI F I T
 Y rs F pe c th BCG (Expe m t l
 d Ch l)

Mi B

H TTE A M d l ARAS J Th Tran m f
 P ll Th gh th Il t

GENITOURINARY SURGERY

Adre i Kidn y a d U t r

NATO I F R l l t p A St dy f j C se
 H A N S d KR TSC MER H L Pyelut f

P gn cy

l w y O S l C M S Th S g l
 A pect f c y D se fth K d y

Bl dd U th d P s

K ETSCHMER H L f d m t os fth Bl dd
 I MATTY J L T thral Rese t th T t

ment f Tru and f se doc rd Bl dd
 M te J R P l p se fth U thra Tre t d by
 th H j l m Ope tu

Genital Org

L TEN M C W d FADA T J L T th l
 Resect f M f ghty M Y rs f Ag

M G B Id path c G ren fth Sc t m

O M J K C J A R M d S
 J A Ope t f U d se d d T t l

Mi c Haneo s

3 2 R OLD L R d W YRAUCH H M Use f
 Peni ll th T tm t f U g tal Inf

3 3 H J H BOTSWORD T W d Tr CHEL
 B E l xpe ces and P gres th T t

ment f Go rhea Army Ge ral Hosp tal
 O rscas (94 t 944)

SURGERY OF THE BONES JOINTS MUSCLES
TENDONS

3 4 Condition of th B s J t Muscl s Te dons Etc

3 4 H TCHE C H Th D lopm t of Sa m n
 B S bj ted t Roe tg Radi m lrr d

3 5

3 6 N e t SFR J S Adh Caps l t fth Sh lde
 A St dy f P th l g cal f d s P n rthru
 fth Sh ld

3 9

Su g ry of th B s Jo ts M scl s Tend Et

3 6 M TER c H W Th T eatm t f B gn G t
 C H T m rs f Res u E d B
 G ft g

3 7 HARLE G H d BRECK L W Cell ph
 B d J t S g ry

3 5 McKEE G K M tal Abast m T be T d n
 S t re

3 5

Orthopedi s in G e l

3 7 L v RD D W Th S gnifica f D l yed Os
 ficat th T atm t f C g tal Cl b-

3 8 foot

SURGERY OF BLOOD AND LYMPH SYSTEMS

Blo d Vess l

3 8 Hc T r J B L g t fth P t t D t A t
 nos

3 8 S s o J H M m C L d N MAN E V
 M lt pl C nital A t n A r ysm

3 8 HODG G B G IM K S d Sc HE L H M
 T eatm t f v n ose v by St pp E

3 8

3 8 N H G Complicating f to th S gic l
 M gement f v n ose v

3 8 ON I L I gati fth Inf v na Ca
 th P t a d T im t f l lmon ry

3 8 Embol m

Blood Tra f s n

3 9 HURADO A M i C d D LADO f I f l
 f An mia th H m po t A tivity

3 9 D GO T E L Th Pos bl R l f Wh l Blood
 Tra fus M l t ry Med a

3 9 TRALHME W T to E S and SH v T S
 Th Tra sf f C t d ged H m Type f

3 9 O C H Res pended d St red i m pe ce t
 C m Syrup

3 9 MUEBLE R O C t t l R d Bl d C H
 Prep t and Use

3 9

McDOALD J. R. HARRINGTON S. W. dCLAETT
O. T. Hamartoma (Ofte Called Chondroma)
of the Lung

CHAMBERLAIN J. M. and GORDON J. Brochus
Adenoma Treated by Pulmonary Resection

SEYBOLD W. D. and CLAETT O. T. Cardiac
Disturbances in the Lung

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ROTHSCHILD L. B. Sinus Abscess Associated with
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BLALOCK A. dTAUSIG H. B. Surgical Treatment of
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HARPER R. A. K. and TICECO E. Benign Tumor
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TRUESDALE P. E. ANWIL G. dCuthbertson
Esophageal Hiatal Hernia

LAFFLY T. C. Cysts and Cystic Tumors of the
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SURGERY OF THE ABDOMEN

THE REVIEW of the Cholecystectomy Carcinoma
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SMITH C. S. WIKOFF H. L. and SOUTHWORTH B. A.
Gastric Acidosis in the Healthy Individual

AARAS A. H. Inflammation of the Upper
Gastrointestinal Tract

ALLEN A. W. G. Truncal Ulcer of the
Stomach

SCHWARTZ S. O. L. Gastric Intestinal Cancer
of the Stomach

APPLEY L. H. P. Type of the Survival Period in
Gastric Cancer

ADE S. A. C. S. T. B. dMAER R. W.
Effect of Gastric Section on the Stomach

MAR HALL, S. F. A. Plan of the Surgical
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GLASSER C. L. D. T. h. a. n. Sug. M. tabolism
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GRISWOLD R. A. Trauma of the Rectum
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GRAY I. T. U. m. R. l. t. P. p. t. U. l. r.
P. U. L. M. St. u. s. f. th. Small Intestine in the
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ROCH V. W. and FISCHER W. A. D. d. al. U. l.
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RIEHO W. F. Jr. An Analysis of the Results of
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HOLLANDER F. ROE S. COLP R. and KARE
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MOGANY C. N. Wounds of the Chest

CAVE H. W. Surgical Experience with the Ulcer
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AYCOCK T. B. dFARR E. M. Appendicitis. The
Possible Effects of the Mesenteric Mobility

HOLLAND C. A. Multiple Carcinomas

SCHLESINGER G. W. H. The Pathology of the
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L. Gall Bladder Pancreas and Spleen

KELLY M. P. dCOMOR M. W. Occlusion of
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ASRAY M. Calcification of the Gallbladder
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SMITH B. C. Acute Cholecystitis. The
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MCGUIGAN W. J. Acute Cholecystitis. A
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SCHLESINGER J. R. dCOLEMAN F. C. Cholecystitis
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CITTEL R. B. Pancreaticoduodenal Resection

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BRIDLEY G. V. S. J. dP. c. l. Tumors

ALETT S. O. and ALP A. F. Sugery of the
Intestine

MASSIE F. M. H. Part of the Abdomen

D. H. H. dHA S. V. T. M. I. St. g. t. f.
The C. and P. t. f. G. P. a. f. l. w.

Abdominal Operation

GYNECOLOGY

Utter

ABARBANEL, A. R. Th. Sp. m. lysant. Act. f.
M. nes. um. f. th. T. ta. cally. C. t. g.

HUM G. vid. Ut. ru.

CASIMIR, B. Z. H. y. t. ct. my. with. P. eserv. t. n. f.
O. r. T. i. s. th. T. m. t. f. E. d. m. t. o.

MEG J. V. Th. W. rth. um. Ope. t. f. Ca.
om. f. th. C. rux.

M. r. W. F. d. S. z. R. T. tal. Abd. m. nal.
Hyst. ectomy.

Adrenal and Pituitary Cytosis

W. T. J. Th. Effect of Testosterone on the
Ovarian Cytology

PARKE T. J. Carcinoma of the Ovary. T. d. f.
operatively with D. ep. X. ray.

External Genitalia

BRADY L M thod f C tru ti ga v m a
 WHAR O L R Spot s P r f t u f th
 Rct gi l Sept m F W k ltr Co
 tru t f th Vagi

OBSTETRICS

Pregnancy and Its Complications

Mc SE R D R DA I L M d Doy L W
 I gn cy f l g My meet my
 AR TELL P F Go DM D W d B ruce
 F J l t D G s P gn cy
 QU LAY J K H b t l Abot
 SCOTT W A S gical C m p l t s D n g P g
 na cy d L bo
 HE T \ S d KR c ME H L Pyelitis f
 P gn cy

Labor and Its Complications

I CH F J R pt f th Ut ru
 POTTER M C ERVI C H W d B o \ J B
 Obs t B h D l G l
 Hosp tal

Newborn

W DP LL W W J d WHIT R AD B W
 N tal M t l ty Rat I fa t P g
 P phyl t c Dose f v t m K
 ROS TH L S R BLA D M d L SLI F I T
 Y rs Expe c th BCG (E p rim t l
 a d Cl l)

Miscellaneous

HOTT A M d PAR J Th T m f
 P cell Th gh th l t

GENITOURINARY SURGERY

Adre i Kidn y a d U t
 N TI F F R l Let p A St dy f J C ses
 H A T N S d KR TSCHM H L l y l t f
 P g n y
 LO Y O S i Cc ti M S Th S g l
 A p e t f y t c D s e c f th K d y

Bladder and Urethra

K ETSCH H L l d m t f th Bl dd
 FARMETT J L Tan thral Rese t th Tre t
 m t f Tru and l se doc rd Bladd
 M IR J R Prol pse f th U thra T ted by
 th H pb Operatu

Genital Organs

LATCHW C W d EMMETT J L T th l
 Resect f M Eighty M re l rs f Ag
 M IR G B Id p th G gre f th Scrot m
 Or p J K Cvr R M f S
 J A Ope t f U d s e c d d T t l

Miscellaneous

RF L L d W YRALCH H M U f
 Penicill n th T tme t of U og tal Inf c
 H O J H BOTS FORD T W d Tr CHL
 B E Expen es and Progres n th T t
 m t f Gon rhea Army Ge ral Hosp tal
 O v rse (94 t 944)

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

Conditio of th B s J ts M cl s T ndo s Etc
 H TCHER C H Th D l p m t of Sa c m
 B S bj t d t Roe t g n Radi m Irrad
 N TASF J S Adhes C pultu f th Sh ld
 A St dy f P th logical l d es P n rthnt
 f th Sh ld

Surgery of the Bones Joints Muscles Tendons Etc

M RD C H W The T tm t f B G t
 C l l Tum r f Res t o F cis d B
 G alt g
 H RLE G H d Br ck L W C l l ph
 B d J t S g ry
 McKF G K M tal A tomo T be T nd
 S t re

Orthopedics in General

L ARD D W Th Sgnifican f d lay d Os
 featu in th T tm t f C g tal Cl b
 foot

SURGERY OF BLOOD AND LYMPH SYSTEMS

Bl d Vess l
 HLT J B l gat f th P t t D t A t
 nos
 S O J H M u G L d \ MA E V
 M l t pl C g tal Art n An ry sm
 th P m ry C cul t
 HODG G B GRIM ON K S nd Sc ie L H M
 Teatm t f A nose \ by Strupp g E
 d f l
 IV H G C m p l cat g F t rs th S g l
 M rem t f A nose
 ONF L I f L g t f th l f A na Ca
 th P t d T tment f P lmon ry
 Embol m

Blood Transfusions

HCB AND A ME O C d D lo po f Infl
 c f An mia th H m po t Act ty
 D GO T E L Th Pos bl R l f Wh l Blood
 Tran fu ns Military Med c
 THALM W TAYLOR E S d S t t T S
 Th Tran fu i C truf ged Human Type f
 O C H R uspe ded d St ed pe ce t
 Corn Syrup
 M TH R O C t ted R l Bl l C l l
 Prep tu and Use

STROMIA M M CH ock F W BLAKE A D
d KARR W G Th Use f Mod fed Glo-
bun f m Huma Erythrocytes as Plasm
S bstut t P lum y R port

Y t L E d KAHNE D H H m lyt T
f s i R t u D t Rh I mp t b l ty

D LRO E G G z F d W L W D
F tal Ai Embolu m D n g Blood T f

R t u lo ndoth l i Sy t m

Coo T B AS Type f H ed t y A m
wth Ell ptocty I t t g Seq c f
Spl ect my

SURGICAL TECHNIQUE

War S g ry

S O P lm ry C (Bla t)
N th a B t t l W d

HAR so J H BOT o T W d T ICHEL
B E Expe d P gr th T t
m t f Go r rh Army G l H p tal
O ea (94 t 944)

D GOW E L Th P bl R l f Wh l Blood
T f Military M d

HAR R I W W d Th P es t Stat f
Th T tm t

E ARD H C R l f E ly W d Cl
T o-St g Op t Appl d It ly

B o n J J M W d f th Soft T T o-
St g T tm t

Co VE s J M E ly d L t T tm t f G
h t W d f th j w F ch B t t l C
lt N th Afr d Italy

A LETT S O d ALS A F S g ry d An s-
th f Abd m l W W d

COOKE W T PE TY A L P T o AS G E KES
J J d O th rs Cl tnd l i f t W
W und

BOLAND F K CLAI OR- E T S d PARKE F P
T h Foot

BE TLEY F H d Th S C t l i f f
t u m R t W und

I NES A d E V H B t t l C l tes
T ted wth P nucll

Do E G GAR z E and W L W D
F t l A Embolu m D g Blood Tra f

Op ratu Surg ry d T hn q P t p ratu
Tr tm t

CLARK A M MILLE G R d To J P Fixa
t u f Ski G ft wth H m l as m d
Th m bin

Y NG F H m g us Cart la G aft
D UM M D R T G L d Ed ARD

J T R Isoimmunizati t th Rh F t

IAS E F M H p rin th Abd m
tz V K N w M thods f H most sis

ta V A Ea ly d Lat Post pe tu Am
b latu A Comparat St dy f 3 C es

Da H H d Ha T M l esti t f
th C se d Pr t u f G Pains f l ing

Abd m l Ope tu

PREMI TE D B Th Mecha m d Manage
m t f S g l Shock 343
M L CHLI J A Th I tra Use f N oca
A s b t t t f M phi Post perat 343

Ant s pte S rg ry T tme t f Wo d a d In
f tu

P r so L W P physl f W d i f f t
St d wth P tcul h f ce t So ps d
I ng t 344

H r J F W oc C B R d N
R W N t l P l S l t l f t d
W d I l B 344

S r W W d H W H I l l Th py
t th U r sty f M esot H p t l f m
94 t 944 344

An th
R m V D A d A J P l g d
Sp l A th 345

M R C Livi to z H d W m V
C t Sp l A thes Obs r v t 346

P r A D Block g f th M d f C l d
St l lat G gh th D d g l f l t t
A esthes T h q A d t d Th
pe t l d t 346

WHIT CR R J d f ne A J Cl n l Ob
t u th U f C An th 347

M n S J d Scn J M Bl t l J d
Th A th t m g m t 347

S g l l trum t d App t
Rht EL D F W d R M W Adj t bl
Ca ts th T tm t f f t D f r m t 348

PHYSICO-CHEMICAL METHODS IN SURGERY

Ro tg l gy

HAR ER R A K. d T sc F B n g T m
f th Esophagu d t D ff l D m 9

A M Calcifed H m g m f th L
P T J C m f th O ry T d l
pe t ly wth D p X ys 3

H CHER C H Th D l pm t f S m
B S b t t t Roe tg Rad m Irrad
t 33

SOUL A B G S W d l J C My
logr phy by th Use f l t p l th D g
os f H m iat f th l r v b l D sc 349

RE T A Th Import f f m f th
Sput m in E l t g I bym l l f l t 349

B HR C F Scm Roe g l l C d
t P r taining t Uppe E t m y f 3

KASABAC H H d Do A C l Roe tg
rpy f H m m f th La y l f t 3

A l L L W l CLAR l A Roe t
bet py f B e k Sa l 35

Miscellaneous

- PACKARD C d EXNE F M C mpariso f
Phys c l d B log l M thod f Depth
Dose M as m t 35
- EXNE F M d PACKARD C Meas ements f
S r f d D pth D se Ratios f m 7 t ooo
K 35
- M d TI W J d S HE so S K The U
f Roe tgenograph f Dosage C t l I t
t t l G mm ray Th py 3

MISCELLANEOUS

D ctless Gla ds

- C RTI G M nd FE TM M B Blood Iod
St dies A A alys f th Blood Iod
Thyr d Disease
- V ERS H R My sth G vi

Surgical Pathology and Diagnosis

- HOLLE D A R d S to P B Lymph d
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Cl k E A 35	H tt A M 3 8	Pa k d C 35 35	T s E 29
C W H 78	Ianes A 34	Paln M V 79	T dd J P 34
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Cook W T 339	K rr W G 33	P l M 3	W dd ll W W J 3 7
Coo y T B 33	K b h H H 35	P ee y A L P 339	W k l y C P G 84
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D s J H 8	K tschm H L 3 9 3	P hl E A 35	Wh t R J 347
D 25 L 81	Lauppy T C 356	P tt r M G 3 7	Wh t h d B W 3 7
DeGow E L 33	Lam C R. 80	Put y F J 8	W k ff H L 29
D lg d E 3 9	Lat h m C W 3	Quig y J K 3 5	W l e h 355
D Ingt m V 34	L na d D W 3 6	R d ll L M 3 4	W t S J 8
Dux J L 3 8	Lesh E I 3 8	R t A 349	W y tt J 3
D lt E G 34	Lays D 80	Reyn ld L R 3	Wyl W D 34
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THE RELATIONSHIP OF CHRONIC LESIONS TO CARCINOMA OF THE COLON—CHRONIC ULCERATIVE COLITIS

Collective Review

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DURING the past decade the results of surgical management of carcinoma of the large bowel have improved dramatically and the application of technical advances has greatly reduced the hazards which too often followed resections of the colon. Now that malignant lesions of the colon in expert hands can be treated in such a manner as to offer a more favorable prognosis to the patient it is our duty to improve the clinical results further through efforts directed at earlier recognition of the cancer. As a step toward this objective we may learn some facts from a careful analysis of our knowledge regarding those diseases of the colon that may have a prefatory relationship to colonic cancer, one being chronic ulcerative colitis.

In order that the extent of this review may be kept within bound the literature of the last ten years only has been surveyed; references to earlier studies have been made only when necessary and when the reason for their citation is evident.

At the outset it may be stated that although a number of reviews have appeared (7, 8, 11, 14, 16, 19, 21, 27, 30, 39, 61) during the past decade our knowledge in this field has not been greatly extended either by the addition of new material or by significant fundamental discoveries.

A review of the recent literature on chronic ulcerative colitis demonstrates the controversial status of all aspects of the subject. In 1939 Willard (62) wrote of chronic ulcerative colitis.

If the two recognized entities, tuberculous colitis and amebiasis, be omitted from discussion there is no agreement as to classification, etiology, natural history, prognosis or treatment of this symptom complex. Six years later in 1945 Willard's statement is certainly just as valid as it

was when first made. There are a number of theories regarding the cause of this disease and the authors are proponents of the several ideas; these have been summarized in Table I.

The data assembled in this table present convincing evidence of the meagerness of our knowledge regarding the exact etiology of chronic ulcerative colitis. Notwithstanding the fact that even during recent years many students have carried on extensive investigations of the problem there is still no unanimity of opinion. Possibly this is true because in the past all of the chronic ulcerative diseases of the large bowel except those due to tuberculosis, amebiasis and carcinoma have been grouped comprehensively together under the term chronic ulcerative colitis. However the present tendency is in the opposite direction and as a result of more experience there is an inclination to define the disease entities within the composite group more precisely. Thus in 1941 Bargen (7) pointed out that chronic ulcerative colitis as it is known today is probably a syndrome consisting of numerous disease entities. Apparently the resolution of this phase of the general problem is still progressing in the same direction. Let cause more recently in 1944 Bargen (8) states:

There are many varieties of ulcerative enterocolitis. One cannot emphasize too strongly the importance of establishing as nearly as possible the nature and cause of a given case. He now recognizes the following seven disease conditions that are characterized by varying degrees and types of chronic ulceration of the colon:

1. Streptococcal ulcerative colitis (also referred to as non-specific or idiopathic ulcerative colitis and sometimes as colitis gravis and thrombo-ulcerative colitis.)

TABLE I.—THEORIES ON THE ETIOLOGY OF CHRONIC ULCERATIVE COLITIS

General Type (Etiology)	Particular Cause or Age Fac	Author Proposed
Allergic	Food and drugs	Andreasson
Endocrine	Endocrine imbalance	Pitts, Skelton, Reed, J.
Infectious (?)	Focal infection	Jackman, DeBakey
Infectious	Dyslipidosis	Berge, Graham, Fed
	Streptococcus	Cawright, Chapman, Borge, 44
	Bacillus dysenteriae	Dick, Adams, 1
	Bacillus dysenteriae	Harris, Harris, P., 6, T. 6, W. 6, 15, F. 15
	Edwardsella	F. 15, 17, Winkler, 15, 3
	Virus	Gallart, 1
	Secondary infection	Pitts, 18, W. 6, 15, 16, Sh. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
Muscular	Muscle spasm	Lumbar, Lumbar, P.
Nervous	Psychogenic	Marr, Reich, 16, Sullivan, 6, W. 6, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
Neural	Autonomic dysfunction	K. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
Tranquilizing	Spasmodic	K. 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
	Mucous	Evans

- 2 Amebic ulcerative colitis
- 3 Ulcerative colitis due to the virus of venereal lymphogranuloma
- 4 Regional ulcerative colitis (cause not clear)
- 5 Regional ileitis
- 6 Tuberculous ileocolitis
- 7 Other intestinal conditions
 - (a) Chronic bacillary dysentery
 - (b) Ulcerative colitis of unknown cause
 - (c) A deficiency syndrome
 - (d) Allergic colitis

In the study of the relationship of this syndrome to carcinoma of the colon information regarding the etiology of chronic ulcerative colitis has a double interest. First of all since most previous reports in the literature have not clearly differentiated particular disease entities and since a number of etiological agents and factors appear to be involved it is unlikely that from an analysis of recorded data we should discover a kinship of cause for the carcinoma and for the pre-existing ulcerative state. In the second place if carcinoma is an important complication of chronic ulceration in the colon the existing data can scarcely be expected to establish more than a sequential relationship of the carcinoma to the preexisting chronic ulceration. Pertinent observations in the literature have been assembled in Table II.

In 1917 Yeomans (67) reported the development of a rectal carcinoma in a woman with chronic ulcerative colitis and from whose bowel he had previously removed several benign adenomas. This case was one of 7 that Yeomans presented

to demonstrate his concept of the precancerous nature of adenomatous tumors of the colon. He stated: "Both clinically and by histological study of the specimens the transition from simple inflammatory hyperplasia to tumors pathologically cancerous can be traced through stages of inflammation, gland cell hypertrophy and hyperplasia and adenoma to definite adenocarcinoma. It is a logical inference that continuance of the irritative factors that induce the adenomas stimulate epithelial hyperplasia until it breaks through normal bound and becomes malignant." A year later in 1928 Bargen (4) reached the same conclusion and wrote: "In view of the various reports in the literature, the frequency with which polypoidosis has occurred in the series of cases of chronic ulcerative colitis at the Mayo Clinic and the simultaneous occurrence of polyp and carcinoma in the diseased colon the following hypothesis is offered: the sequence of events in some cases of malignant disease of the colon is chronic ulcerative colitis, multiple polypoidosis and malignant disease." Since then Bargen and Comfort (9), Burst and Bargen (15), Barlow and Dixon (16), Bargen, Jackman, and Kerr (11), Streicker (56), Matzner and Schaefer (44), Rankin (51), Jackman, Bargen, and Helmholtz (37), Sauer and Bargen (55), Cattell (17) and others have subscribed to this thesis as it was originally stated by Yeomans and later by Bargen.

The observations and conclusions of other authors however have supported an opposing view. In 1934 Ewing (26) stated: "It is somewhat

remarkable that carcinoma very rarely develops in chronic ulcerative proctitis or colitis. In 1939 Swinton and Warren (59) basing their conclusions upon extensive material wrote "It is possible in our series to demonstrate histologically all stages in the sequence of change from normal colonic mucosa to actual adenocarcinoma."

From a microscopic study of a large series of intestines from patients with chronic ulcerative colitis both specimens removed surgically at varying lengths of time after onset of the disease and specimens obtained at autopsy we believe that chronic ulcerative colitis is not a factor predisposing to the development of polyps.

In our patients with ulcerative colitis we have observed another interesting fact. Following healing of the acute ulcerative process we have known these pseudopolypoid tumors to regress and disappear. We have never observed the regression or disappearance of true polyps of the large bowel except in rare instances in which the polyp has broken away from its pedicle. This of course also definitely suggests that the pseudopolypoid tumors resulting from known irritation and infection have different fundamental growth characteristics than the discrete and multiple polyps which are not the result of known infectious processes.

We have never observed the polypoid changes seen in ulcerative colitis progress to a malignant stage. Moreover Hurst (34) in 1935 Willard with his associates in 1938 (63) and Feder (27) in 1939 have reported on series of cases comprising respectively 40, 66 and 88 patients with chronic ulcerative colitis with no carcinomatous change.

With the foregoing general summary of the conflicting opinions the data arranged in Table II may be analyzed.

During the last twenty years and apparently because of the continuing interest of Barger numerous papers on this subject have appeared in which the accumulating material from the Mayo Clinic has been utilized. Barger's name is associated with the majority of these reports. An attempt has been made in Tables II and III to congregate the findings recorded in these papers and in order to extract the data essential to this study the successive reports have been compared. It is unfortunate that individual reports were not regularly included so that the cases could be accurately identified.

The data presented in Table II may be rearranged and summarized in three categories:

1. The literature contains the reports of 3 individual cases of chronic ulcerative colitis in which carcinoma of the colon developed as a complication. Of these 33 cases 4 were reported as

isolated cases and 29 were reported as individual cases belonging to groups of cases with colitis.

2. Observations on the associated incidence of carcinoma of the colon and chronic ulcerative colitis have been recorded in 7 series of cases and in each the percentage of cases with carcinoma has been calculated. When these groups are combined it appears that 28 patients among a total of 1,467 cases of chronic ulcerative colitis developed carcinoma. On the average therefore the incidence is 1.9 per cent and the percentage for each of the four series in which it could be calculated separately was 1.3, 1.6, 2.16 and 3 respectively. In 3 other series made up of 40, 66 and 88 cases respectively no case of carcinoma was observed. In 1940 Jackman, Barger and Helmholz (37) studied a group of 95 children in whom 6 carcinomas developed later in life; this was an incidence of 6.3 per cent among those who suffered from colitis as children. A summary of these records is presented in Table III.

3. In 1944 Cattell (17) and Sauer and Barger (55) reported on groups of 11 and 26 cases respectively in which carcinoma of the colon developed as a complication of chronic ulcerative colitis in their papers which together report a total of 37 observations; no individual case records were included nor was there a record of the total number of patients with colitis among whom these cases of carcinoma appeared.

The matter of carcinomatous transformation of adenomatous polyps in the colon and particularly the relation of chronic ulcerative states to that problem and to an increased incidence of carcinoma are of practical and theoretical interest. From the clinical point of view the natural history of a disease must be charted before the value of therapeutic measures can be estimated. From the standpoint of cancer control it is essential that cognizance be taken of all predisposing influences. Furthermore the pure scientist has an interest in any evidence which may be garnered to demonstrate a relationship between chronic irritative processes and the malignant state.

General incidence. Critical analysis of the accumulating data appears to fortify the hypothesis enunciated by Leomans and by Barger that there is an increased incidence of colonic carcinoma in chronic ulcerative colitis. Recently Cattell (17) wrote: "For a number of years our observation indicated that malignancy was a rare development on the basis of chronic ulcerative colitis. However in the last two years we have observed 8 patients with carcinoma arising in ulcerative colitis and previous to this period 3 additional patients had been seen. At present we believe

TABLE II.—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

Serial Number	Year of Publication	Author	Sex	Age at Onset of Disease	Duration of Disease (Years)	Site of Carcinoma	Number of Cases Reported	Site of Disease at Death	Number of Cases Reported	Site of Disease at Death	Location of Carcinoma
		Yeoman	F	33	7						Rectum
	8	B g ()								()	
	8	B (b)		1	()	()		()			(Rectum)
	8	B (b)	M	()	()			()			(Mid-pl)
5	8	B ge (b)	M	()	()			()			(Rectum)
6	9	Ba (b)	M	()	()			()			(Transverse Colon)
	8	B g ()	M	()	()						(Cecum)
8	9	B (d)				()			()	5	
9	35	H rs ()									
	5	H rs (f)									
	935	H (f)	F								Rectum
	5	H rs (f)	M								
		Barge d D (g)									Rectum
	9	B g d Dix (g)									Cecum
5	5	B ge d D (g)		6							E. Col
6	9	B d Dix (g)	M		8						Rectum
	5	B g d D (g)		3	8						Cecum
8		Barge d D ()		8							Transverse Col
9	3	B g d D (g)		5							Rectum d Cecum
20	3	Bar d D so (g)			5						Sigmoid d Splenic Fl
		B g d D ()									Mid-l Rectum
		Barge and D (g)			8						Transverse Col
	35	B d Dix (g)		38							Splenic Fl d Desc
		Barge d D (g)		5	6						?
5	5	B d Dix (g)									Transverse Col
6	5	B g and D (g)		60	8						Sigmoid
	5	B g d Dix ()									Mid Fl
8		B ge d Dix ()		6							Cecum
		B g d Dix (g)		5							Descending Col
		B and Dix ()			/						Mid Flexu
		B d Dix (g)		60	5						Rectum
		B and Dix (g)									Mid-pl
	5	B rg and Dix (g)									Cecum
		Bar d Dix (g)									Mid-pl
	5	B re d Dix ()		65	8						Sigmoid
6		B rg d Dix (g)									Rectum
		Barge d Dix ()		34							Rectum

TABLE II—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS—Continued

Serial Number	Year of Publication	Author	Sex	Age at Onset	Age at Death	Duration of Illness before Death	Number of Cases Reported	Number of Cases with Carcinoma	Number of Cases with Carcinoma	Number of Cases with Carcinoma	Location of the Carcinoma
35	35	Berg and Dixon (g)		6	6						Cecum
2	35	Berg and Dixon (g)	F	5							Rectum
	5	Chapman									Rectum
4	35	Berg, Jackson and K. (h)					87		(5)	3	
	35	F. J. (i)					88			—	
3	35	S. K. (j)					7			3	
		Willard (k)					66			—	
5	93	M. J. Schaefer (l)	M				()				Sigmoid
6		M. J. Schaefer (l)					95			3	6
7		Jackman and H. L. (m)					(5)		(6)	63	
8	44	Case (n)								6	
9		Saunders								6	
		Total ()					6		()		

For a more complete list of cases, see the following references: (g) Berg and Dixon (g) (h) Berg, Jackson and K. (h) (i) F. J. (i) (j) S. K. (j) (k) Willard (k) (l) M. J. Schaefer (l) (m) Jackman and H. L. (m) (n) Case (n) (o) Saunders (o) (p) Total ()

(g) Berg and Dixon (g) (h) Berg, Jackson and K. (h) (i) F. J. (i) (j) S. K. (j) (k) Willard (k) (l) M. J. Schaefer (l) (m) Jackman and H. L. (m) (n) Case (n) (o) Saunders (o) (p) Total ()

(g) Berg and Dixon (g) (h) Berg, Jackson and K. (h) (i) F. J. (i) (j) S. K. (j) (k) Willard (k) (l) M. J. Schaefer (l) (m) Jackman and H. L. (m) (n) Case (n) (o) Saunders (o) (p) Total ()

(g) Berg and Dixon (g) (h) Berg, Jackson and K. (h) (i) F. J. (i) (j) S. K. (j) (k) Willard (k) (l) M. J. Schaefer (l) (m) Jackman and H. L. (m) (n) Case (n) (o) Saunders (o) (p) Total ()

(g) Berg and Dixon (g) (h) Berg, Jackson and K. (h) (i) F. J. (i) (j) S. K. (j) (k) Willard (k) (l) M. J. Schaefer (l) (m) Jackman and H. L. (m) (n) Case (n) (o) Saunders (o) (p) Total ()

(g) Berg and Dixon (g) (h) Berg, Jackson and K. (h) (i) F. J. (i) (j) S. K. (j) (k) Willard (k) (l) M. J. Schaefer (l) (m) Jackman and H. L. (m) (n) Case (n) (o) Saunders (o) (p) Total ()

that malignancy while somewhat rare is most frequent in patients who have had ulcerative colitis for over five years. We have been following patients carefully for these last fifteen years and in those who have had symptoms for a long time an increasing incidence of carcinoma has been noted. This statement is especially important for a since it is based upon further experience

at the Lahey Clinic, it may be thought to alter somewhat the force of the negative expression made by Swanton and Warren at an earlier date (quotation on p. 656).

As has been pointed out the average incidence of carcinoma as calculated in the reported series of cases of chronic ulcerative colitis is 1.9 per cent. Statistically this figure would require the same

TABLE II—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

[illegible]

TABLE II.—PUBLISHED REPORTS OF CARCINOMA OF THE COLON WHICH DEVELOPED IN PATIENTS HAVING CHRONIC ULCERATIVE COLITIS—Continued

Serial N. mbe	Year of Publication	Author	Sex	Age at Onset of Disease	Time from Onset of Disease to Death	Number of Cases of Carcinoma of the Colon Reported	Reported by	Number of Cases of Carcinoma of the Colon Reported	Reported by	Location of Carcinoma
33	35	Berge and Dux (g)		5	6					Cecum
39	935	Berge and Dux (g)	F	5						Rectum
	6	Chapuy								Rectum
	5	Berge and Jackman (h)				87		(8)	3	
	35	Fed (i)				88			—	
	935	Schick (j)				7			3	
44		Wilder (k)				66			—	
5		Martin and Schaff (l)	M			(7)				Sigmoid
5	939	Martin and Schaff (l)				85			3	6
		Jackman, Berge and Hillman (m)				(5)		(6)	63	
5	44	Case (n)								
44		Saunders (o)							6	
		Talbot (p)				6	3		(1)	

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that malignancy while somewhat rare is most
frequent in patients who have had ulcerative
colitis for over five years. We have been follow
ing patients carefully for these last fifteen years
and n those who have had symptoms for a long
time an increasing incidence of carcinoma has
been noted. This statement is especially impor
tant for nce it is based upon further experience

at the Lahey Clinic it may be thought to alter
somewhat the force of the negative expression
made by Swinton and Warren at an earlier date
(quotation on p 636)

As has been pointed out the average incidence
of carcinoma as calculated in the reported series of
cases of chronic ulcerative colitis is 19 per cent.
Statistically this figure would require the sam

TABLE III—PUBLISHED REPORTS ON THE OCCURRENCE OF CARCINOMA IN GROUPS OF PATIENTS HAVING CHRONIC ULCERATIVE COLITIS

Author	Number of Cases of Chronic Ulcerative Colitis		Number of Cases of Carcinoma of the Colon		Percentage
	No. of Cases	Group	No. of Cases	Group	
Myer & Clark	60	60			5
Berg & Jackman	8	8	7	(8)	
Jackman & Helmholz		5	6		
H					—
Fed	83	8			—
reuk	5				3
Willard	66	66			—
Mason & Schaff	35	35			6
Total					

pling of approximately 100 cases before a new average finding could be interpreted as having significance. It is interesting to note (Tables II and III) that the only published series in which no carcinoma was found are those numbering less than 100 (40, 66 and 88) cases. On the other hand in each of the larger series (185, 21 and 871 respectively) carcinomas were observed. Granting the statistical validity of the assumption calculation of the incidence with the inclusion of the three smaller series of less than 100 cases may have produced an abnormally low average figure on this basis it seems likely therefore that a figure of slightly more than 1 per cent may on the average express the incidence of association for these two diseases.

Sex incidence. Of the 18 cases in which the sex of the patient was recorded 8 occurred in males and 3 in females. These are too small numbers to have intrinsic significance. More data on this point are needed they are needed to aid in determining whether or not there may be a deviation in the incidence of carcinoma in patients with colitis from that in persons not so afflicted.

Age incidence. In 3 instances we have a record of the patient's age at the time when the carcinoma was discovered (Table IV). With these few figures the distribution according to age is shown in Table IV. Here again more recorded observations will be important.

In this connection attention needs to be called to one contribution of the greatest importance. Jackman, Bergen and Helmholz (37) reported a group of 95 patients who were less than sixteen years of age at the time of the onset of symptoms of chronic ulcerative colitis. As may be seen from Tables II and III 6 of these children later (after childhood) developed carcinomas—an incidence of 6.3 per cent. Jackman and his associates pointed out that although carcinoma of the large bowel was found in 3.2 per cent of their entire group of 871 patients when this group of 95 (in which the symptoms of colitis had appeared during childhood) was studied separately, carcinoma appeared nearly twice as frequently (6.3 per cent). Indeed as these authors state: "In general the only significant difference in complications between the two groups is the relatively high incidence of carcinoma of the colon among children."

Again it is unfortunate that more data on each member of this juvenile group were not recorded. It would be most instructive to know in each case the interval between the onset of the colitic symptoms and the discovery of the malignant change. In this group of 95 children colitis began in each year of life with greater incidence in each of the years from ten to sixteen inclusive. Were the 6 who developed carcinoma among these of the 95 in whom the colitis began in their early years or were they from among those in whom this condition began in the later period? Were these 6 children those who accounted for all of the cases that became malignant during the third decade (Table IV)? Can it be that the 1 case of lymphatic leucemia and the 2 cases of lymphosarcoma (so much more common in early life than is carcinoma) mentioned in the report by Bergen and Dillon (10) were among these 95 children? If so 2 or possibly 3 cases would need to be subtracted from the 6.

The duration of the colitis in years prior to the development of carcinoma is recorded for 9 cases and ranged from three fourths of a year to 2 cases to thirty six years in 1 case of great chronicity.

The segmental location of the carcinoma within the large intestine is recorded for 29 patients: in 9 cases the carcinoma was in the rectum; in 5 in the cecum; in 3 in the transverse colon; in 2 in the sigmoid; in 2 in the hepatic flexure; in 1 case in the splenic flexure; and in 1 in the descending colon. In another instance the entire colon was involved. In 5 other cases multiple carcinomas were found: in 1 of these cases the tumors were confined to the rectum; in another there was a carcinoma in the rectum and one in the cecum; in the third case carcinomas were found in the

TABLE IV—DECADE IN WHICH A CARCINOMA OF THE COLON WAS DISCOVERED IN 31 CASES OF CHRONIC ULCERATIVE COLITIS

Years by Decades	0-9	10-19	20-29	30-39	40-49	50-	60-69	70-79	80-89
No. of Cases	1	1	5	6	1	6	5	1	1

sigmoid and in the splenic flexure and in 2 cases multiple carcinomas were found but not localized in the description. A greater number of observations are needed to test the significance of the segmental distribution as well as of the occurrence of multiple tumors.

Thus an analysis of the recorded data seems to demonstrate an increased incidence of carcinoma among sufferers from chronic ulcerative colitis. However, before the increased incidence can be finally established the problem should be approached from two other points of view. In the first place the general hypothesis needs to be critically scrutinized and in the second place the hypothesis can be removed from the realm of argument only when supported by a greater number of observations.

GENERAL CRITICISM OF THE HYPOTHESIS

In chronic ulcerative colitis there is the following sequence of pathological circumstances: long continued inflammation, extensive damage to the bowel wall and more or less adequate repair (6). It would not be particularly surprising if such preparation did lead to a malignant change for in a variety of other conditions much clinical evidence has been assembled in favor of chronic irritation as a cause of cancer (12). It is not necessary to presuppose a neoplastic factor (15) peculiar to chronic ulcerative colitis and it is not to be required that a common cause for the two conditions should be demonstrated.

If chronic destructive lesions of the colon lead to an increased incidence of malignancy, a similar relationship might be expected in groups of cases of amebiasis and tuberculous colitis. Reports on such series would add importance to the literature.

A further study of the relationship of polyposis to carcinoma of the colon is in order and the place of polyps in relation to the carcinomas that develop in cases of chronic ulcerative colitis should be determined. Klemperer (38) has said, "A striking predilection for rectum and sigmoid is not evident for polyps as for carcinoma. More than 75 per cent of the latter are found in these parts of the colon while only 43 per cent of polyps are found in rectum and sigmoid. Furthermore the literature contains such contrasting opinions as those of Swinton and Warren (59) and Bergen (6) and in the future it will be important

to distinguish carefully between pseudo- and adenomatous polyps (45, 61).

General mortality statistics of recent date (*Special Report U. S. Bureau of the Census 1940*) indicate the high frequency of colonic cancer which accounts for about 11 per cent of all deaths from cancer. For this reason when dealing with data pertinent to the present problem an attitude of cautious discrimination must be maintained.

Finally in the statistical evaluation of evidence for the elucidation of problems in which the mathematical preponderance is not likely to be dramatic the greatest care must be employed in the scrutiny of individual case reports in the inspection of source and in the critical assemblage of organized data. For example in the utilization of reports from large and popular clinics assurance must be available that no factor of selection has entered as the result of a tendency to collect unusual cases, selection of this type or on any basis will distort the picture of the natural history of the disease.

THE HYPOTHESIS REQUIRES THE SUPPORT OF MORE OBSERVATIONS

The practical and theoretical importance of the hypothesis which is here considered cannot be denied. Attention is called to the paucity of available reports. In order to refute or to establish the hypothesis more detailed and more extensive data than has thus far been published are necessary. Probably a statistical study of possibly 5,000 cases of chronic ulcerative colitis will be essential and it seems likely that data in this amount are now in the records of gastroenterologists and proctologists of this country.

To be of proper value future reports on groups of cases should regularly record certain information and individual reports should include the data required for their admission to a series. It would enhance their value if the following eight items were to be found in each case: (1) sex of the patient, (2) age of the patient when carcinoma was recognized, (3) duration of the colitis in years and/or months prior to the development of carcinoma, (4) number of cases of colitis observed among which carcinoma was sought as a complication, (5) diagnosis of carcinoma made by histological examination, (6) evidence of pre-existing polyp (inflammatory pseudopolyp or adenoma).

tous polyp) (7) segmental location of the carcinoma and (8) special features of the carcinoma (single multiple or diffuse)

SUMMARY

1 The literature contains a paucity of reports on the associated incidence of colonic carcinoma in chronic ulcerative colitis. The reports of only 98 cases have been found in which the diagnosis of the carcinoma was made histologically.

(a) Thirty three individual case records have been published

(b) Sixty five cases have been reported in groups

2 The literature contains a record of 7 series of cases of chronic ulcerative colitis in which the associated incidence of carcinoma was observed.

(a) Among a total of 1467 cases of chronic ulcerative colitis 28 patients developed carcinoma and the average incidence was 1.9 per cent.

(b) In isolated reported series the incidence was 0.0 1.3 1.6 2.16 and 3.2 per cent.

(c) A single series of 95 children with chronic ulcerative colitis was studied. 6 carcinomas were found later in life an incidence of 6.3 per cent among this group.

3 From the practical and theoretical points of view the hypothesis that there is an increased incidence of carcinoma in chronic ulcerative colitis is an important concept.

(a) Available evidence appears to support the hypothesis.

(b) To finally establish the hypothesis a study based upon more extensive material and more complete data is necessary.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Berke R N Resection of the Levator Palpebrae Muscle for Ptosis with Anatomical Studies
Arch Ophth Chic 945 33 69

The author discusses resection of the levator palpebrae superioris muscle for the correction of ptosis. He points out that ptosis may be acquired or congenital, unilateral or bilateral, partial or complete, and that there are three categories into which surgery for the correction of ptosis may be divided.

In one category the frontal muscle is utilized, in the second the superior rectus muscle is used, and in the third the levator palpebrae is resected or advanced. The last procedure is the operation of choice and seems to yield the best results, provided that the levator muscle is not completely paralyzed.

In the second category the levator muscle of the upper eyelid includes the following: (1) the levator muscle of the eyelid (Erb's), (2) the levator muscle of the eyelid (Erb's), (3) the levator muscle of the eyelid (Erb's), (4) the levator muscle of the eyelid (Erb's), (5) the levator muscle of the eyelid (Erb's), (6) the levator muscle of the eyelid (Erb's), (7) the levator muscle of the eyelid (Erb's), (8) the levator muscle of the eyelid (Erb's).

The disadvantages of operations on the levator muscle are as follows: (1) negligible postoperative recession, (2) absence of lagophthalmos, (3) the eyelid muscles with the eyeball, (4) the migration of the eyelid, (5) the medical, (6) a good lid fold results, (7) no diplopia, (8) the weak gag reflex, (9) the distal bed.

The disadvantages are that this procedure can be used only when the levator muscle is present and active and correct on may result and lagophthalmos may result if too much tissue is resected. Inadequate correction of ptosis by resection of the levator muscle through the conjunctiva may be attributed to the untentative resection of Müller's muscle instead of the tendon of the levator muscle, resection of an insufficient amount of the levator tendon, ligation of the sutures or absence of the levator muscle. The author concludes from his experimental work that in resection of the levator muscle through the conjunctiva Müller's muscle and the tendon of the levator muscle will join together.

JOHN ZUCKERMAN, M.D.

EAR

Baker E E The Cause of the Relationship of Lymphoid Tissue about the Eustachian Tube and Ear Pathology
Laryngol 945 55 74

The author classifies the percentage of about the chial tissue in four types as follows:

Type 1 in which there is no demonstrable lymphoid tissue about the orifice.

Type 2 in which there is a minimal amount of lymphoid tissue demonstrable.

Type 3 in which there is a moderate amount demonstrable.

Type 4 in which there is considerable lymphoid tissue about the orifice, sometimes lymphoid bands are present and the orifice of the tube has been narrowed.

Five cases are reported, all of which were subjected to adenoidectomy with the LaForce adenoidectomy.

JAMES F. DELANEY, M.D.

Kinney C E A Critical Review of the Fenestration Operation Report of Cases
Laryngol 1945 55 7

The essential indications for the fenestration operation include bilateral progressive hearing impairment, essentially normal tympanic membranes, and mastoiditis. In bilateral audiometric air conduction hearing loss of an average of 40 decibels, the frequencies between 128 and 4096 and a bilateral audiometric bone conduction of a 10 dB loss of not greater than 25 decibels, concurring the same frequencies.

Prolonged observations on 3 cases of otosclerosis showed that in which the bone-conduction response had been increasingly poor for the frequencies from 1024 up and in these the bone conduction on loss had proved to be progressive. Of the 8 fenestration cases reported, 2 were in this group and these 2 failed to demonstrate a satisfactory hearing gain. The author therefore considers that a bone conduction curve showing a steadily decreasing response from 1024 up and is a contraindication for operation. An average threshold loss of less than 35 decibels for the 512, 1024, and 2048 frequencies for air conduction is considered the level of practical hearing. Psychologically, however, it is better to speak of the hearing percentage rather than the percentage of hearing loss.

For the recent results in 8 cases fenestrated over six months previously, the method of determining the percentage of hearing recommended by the American Medical Association was utilized. On this basis, an 8 percent hearing or better can be considered as an excellent result or restoration to the practical level. Such a result was obtained in 4 of 8 cases. The result was unsatisfactory in the other 4 cases because of poor operative technique, closure of the fenestrum, or according to the criteria outlined by the author, the classification of the results of successful results are unwarrentable.

JAMES R. I. D. M.D.

Uses D Hyperthyroidism Treated with Methyl **Thiouracil** *Lancet* **Lo d.** 945 48 46

Methyl thiouracil was used in the treatment of 16 patients with hyperthyroidism with good results. No toxic symptoms of importance were observed by the author.

We are ignorant of the cause of Graves disease. There are few if any cases in which the evidence points to a purely local cause in the thyroid gland itself. Adenoma exists more often without than with hyperthyroidism. Proptosis, myasthenia, and possibly other features occur coincidentally but are dissociated from the symptoms directly attributable to an excess of thyroxine. Treatment with thyroxine alone by sedation by parathyroidectomy or with thyroidectomy or radiation or with iodine or thiouracil cause a decrease of the circulating thyroxine. The disease is thereby cured either because the relative thyroxine deficiency produced is sufficient to cause the overproduction or because the original cause is itself a component of the hyperthyroidism and disappears when this is corrected.

The discovery of the action of thyroxine indicated compounds on the thyroid gives us the power of regulating thyroid activity with an accuracy quite unsurpassed by other forms of treatment used for hyperthyroidism and indeed unsurpassed by the whole field of endocrinology. For the present and until experience has fully determined the optimum conditions of treatment it is best that the compounds should be supplied by the specialist with full laboratory control. The follow-up is exceedingly important and should be under the supervision of the specialist also. **Ch B M D**

McClintock R D and Lamm C R End Results in **the Treatment of Hyperparathyroidism** *A* *S* 945 2 454

Disorders of the parathyroid glands may give a history of urinary calculus, skeletal laboratory pathologic fractures, osteoporosis, and metabolic bone disease. Roentgenograms of the skull and long bones give confirmation. Laboratory tests clinch the diagnosis. There is levitation of the serum calcium and phos-

phatase and lowering of the serum phosphorus. Six cases are reported.

Case 1. A woman age forty-four complained chiefly of pain in the right chest and right thigh. There was an effusion in the chest and the roentgenogram of the femur showed a destructive process involving the lower third of the femur. A pathologic fracture of the lower third of the left femur developed. Further studies were carried out. The patient died. Surgery on the parathyroid glands had not been performed. Parathyroid poisoning was considered as a cause of death.

Case 2. A woman age fifty-one had a pathologic fracture of the femur. A cystic parathyroid adenoma was removed. The patient died from nephritis and hypoparathyroidism.

Case 3. A man age fifty-one presented a picture of cachexia. Roentgenograms of the skull and long bones showed osteoporosis. Small areas of calcification were present in the thickened ribs. Hyperparathyroidism was confirmed by laboratory studies. A parathyroid adenoma was removed on the right side. The patient made a remarkable recovery with complete return to excellent health.

Case 4. A young man age nineteen complained chiefly of renal colic. An exploration of the neck for a parathyroid tumor was carried out. A parathyroid adenoma and an adenoma of the thyroid gland were removed. Conal secretion was uneventful.

Case 5. A girl age fourteen complained of back pain. Laboratory studies showed abnormal calcium, alkaline phosphatase, roentgenograms of the ribs were confirmatory. Surgery revealed an adenoma on the left parathyroid gland. Convalescence was almost uneventful. The back knee deformity cleared up without operation.

Case 6. A young girl age eight complained of a lump in the neck and pain in the right hip. A right parathyroid adenoma was removed. Recovery was uneventful.

The following patients have followed operation and all appear to be normal individuals.

Richard J Bennett J M D

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

David L. Perry T. G. and Carroll W. Surgical Principles Underlying the Use of Craft in the Repair of Peripheral Nerve Injuries *A. N. S.* 1945 1: 686

The repair of peripheral nerve injuries has finally reached the state of a completely recognized definite plan of treatment. This has been due to the lack of argument concerning the histological changes associated with regeneration and the failure to follow up large groups of patients from a clinical viewpoint and thus evaluate the various surgical procedures.

The ideal method in the repair of a severed nerve is accurate end-to-end suture through the perineurium at the earliest time possible. This necessitates the use of very fine silk suture without damage to the nerve fascicles. In large wounds, especially when they are associated with fractures, the possibility of a severed nerve should be kept in mind. If the loss of nerve substance precludes primary suture, the nerve ends should be identified and a metallic suture clip applied to facilitate surgery at a future date.

It is very important that a potentially infected wound does not deteriorate from apposition of the nerve ends for regenerating nerve fibers are quite resistant to infection and the perineurium forms an excellent barrier to the surrounding suppuration. Histological evidence reveals that the nerve fibers grow down into the distal segment; the presence of suppuration, however, regenerative nerve occurrence when the nerve fascicle was infected.

The use of the suture method has been a great advantage in preventing infection but it does not imply any letdown in performing meticulous debridement and mechanical cleaning. This enables us to allow much earlier exploration of the wound and the performance of a later anastomosis without the fear of an infectious flare-up—even when a primary infection has been present.

The use of nerve grafts has not received the credit it deserves. Cable grafts and chemically fixed grafts have not proved satisfactory. However, fresh autogenous and homologous grafts of similar thickness and size if divided in two should be used. Of these, only the homologous graft will through its sensitivity be obtainable. The autogenous grafts are more satisfactory because they originate in the same structural elements and results in a morphologically similar structure. The homologous graft becomes a biotransformation of structure as it is completely replaced by the neurotization of the host's neurogenesis. Nevertheless, satisfactory neurotization exists. It is suggested that the distal suture should be resutured and resutured by the same experimenter has shown that by the time the nerve fibers have reached the site of connection, the function may prevent further degeneration.

Although the seriousness of concussive nerve damage in gunshot wounds has long been recognized, the authors describe in detail the actual histological changes that result. The immediate damage is much more extensive than seen in sharply severed nerves and extends for several centimeters both proximally and distally. This is differentiated from Wallerian degeneration in that a severe molecular decomposition of myelin and damage to the Schwann cell result while the mesodermal endoneurial elements survive. A resulting heteromorphous structure is then the regenerating picture.

An interesting finding was that nerve contusion may interrupt the continuity of the perineurium and result in an outgrowth of nerve fibers through the defect. This explains the many variations in return of function on lack of regeneration in contusion injuries to the peripheral nerve.

JACK I. WOOLFE, M.D.

BRAIN AND ITS COVERINGS CRANIAL NERVES

Robbins S. L. Brain Abscess Associated with Congenital Heart Disease *A. M. J.* 1945 75: 79

Only 26 cases of the rare syndrome of brain abscess with congenital heart disease have been reported in the literature; this includes the 3 forming the basis of this article. They were selected from 788 autopsies performed during the years from 1936 to 1943 at the Mallory Institute of Pathology of the Boston City Hospital.

The 3 cases are well documented and presented from the pathological point of view, although the clinical record is adequate. None was diagnosed before death. All 3 occurred in females aged between 12 and 27 years respectively. No focus of infection was found in any case and it was inferred that the involvement of the brain as due to a systemic embolism from some unknown source. The 3 cases presented the triadology of Fallot, which consists of (a) decompensation of the left (b) pulmonary stenosis (c) defect in the interventricular septum. One case had patent ductus arteriosus. Only 2 of the 26 cases in this literature were correctly diagnosed before death.

Attempts were made to produce focal areas of encephalomalacia in rabbits by injecting particulate matter into the internal carotid artery followed in from ten to twelve days by the injection of virulent cultures of gangrenous tissue. The attempts were unsuccessful and work on this phase is in progress. The hope is expressed that in these cases of congenital heart disease with focal neurologic signs, correct diagnosis may permit the development of successful surgical intervention.

ADRIAN E. BRUGGER, M.D.

skull in relation to the plane of the coronal suture failed to give a definite answer. It did appear that there was a slightly better chance of avoiding these sequelae as well as persisting incontinence by performing lobotomy in the plane of the coronal suture or anterior to it rather than more posteriorly.

HARRY A. SHERMAN, M.D.

Brandes W. W. and Sutton J. B.: A Pesacral Cyst Apparently Arising from the Nuchal Ligament in a Newborn Infant. *Arch. Path. & Clin. Med.* 945:39:265.

Developmental anomalies are not infrequent in the sacrococcygeal region because of its complicated embryological evolution. In this region early in embryonic life the neuroenteric canal is a common communication between the central canal of the spinal cord and the postanal gut. In adult life the postanal gut and the neuroenteric canal are obliterated.

A great variety of tumors with various descriptions have been described in this region. The author's case is unique in that the cyst was lined throughout with a well differentiated glial tissue of uniform thickness. Ependymal cells were present in scattered areas. The structure of the cyst and its position anterior to the sacrum suggested that it arose from the neuroenteric canal because the main lining tissue was neural tissue.

The infant girl three days of age with a limited cystic mass the size of a grapefruit situated posterior to the rectum and anterior to the sacrum.

Urination and defecation were not interfered with although the tumor grew very rapidly in size in the three days following birth. There were no clinical indications of any connection with the central nervous system.

The growth was successfully removed at operation. ARIEL V. UGHEV, M.D.

Stern K. and Odom G. L.: Morphological Alterations of the Neuron Due to Tumor Invasion. *Arch. Path. & Clin. Med.* 945:39:1.

The reaction of the neurons to various intoxications and circulatory disturbances are well known and the reaction of these cells to adjacent pressure has also been studied. In this article the reaction of the neuron to invasion by glioma cells is studied. Postmortem material only was used and various types of gliomatous tumors were found in this series of 36 tumors. Stains of all kinds were employed to show changes in the nerve cell.

Intact neurons were found at various depths within the tumor and there was often no intermediate stage between complete preservation and complete destruction of the cells. Most of the changes seen were explained on the basis of simple atrophy due to pressure. The changes usually seen in circulatory, infectious or intoxic diseases were entirely absent in the neurons found in various parts of the gliomatous tumors and a surprising number of the neurons remained intact in the depths of such tumors.

ADRIAN VERER, II, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Wak I y C P G Duct Papillomas 1 th Breast
Brü M J 1945 1 436

Duct papillomas are usually always found in the large ducts and are therefore situated beneath the nipple or the areola. The majority of these tumors are single but in some cases multiple papillary growths re to be found within the ducts. The common single papilloma often has a stalk and some pathologists have termed single stalk papilloma. It always occurs beneath the nipple and frequently causes bleeding from it.

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nipple may be ca s d by carc noma chr nic cy t c
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th surgeon to make a d fferential diagno is of the e
th e c nd tions

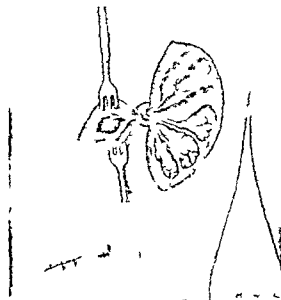


Fig. 1. Diagram of the dissection of the papillom. The dissection is shown in the inset. The skin is dissected by the method of the author.

Every case must be examined carefully and at definite intervals until it is certain that a delayed cicatrix can be felt. When this is established local excision of the delayed cicatrix with the papilloma can be undertaken. The incision should radiate from the nipple over the delayed cicatrix. The skin edges remain apart the cystic dilatation is opened and the intracystic papilla is completely excised. The operation is simple and no damage is done to the ducts on the side. The skin incision is closed with a few interrupted sutures and when healed is scarcely noticeable.

Every excised papilloma should be examined microscopically for a evidence of malignant change. The patient should be examined at three month intervals during the first year. After this time a yearly examination will suffice.

STEPHEN A. ZIEM & M.D.

TRACHEA LUNGS AND PLEURA

Tlancey W S Moe s h H J and McDo Id J R
 T mors f th Trach a 1 h Ol ls Ch 945
 4 34

The present study based on a series of 27 cases of neoplasm of the trachea in the Mayo Clinic.

C r i s t o m a m a y c o u n y w h e r e i n t h e t a c h e
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Only 3 p t n t s h d n v e n t o n f t k l g o l
a l u m p n t h e t h r a t T h m o s t f e q n t a d m p
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l u m e n D y p a a s a p r m e t m p t m 24
a s e s (80 p e c t) a d w a t h t l j t m i

(81 per cent) Dyspnea may be constant or paroxysmal and is frequently affected by change of position.

Cough was an important symptom in 15 cases (56 per cent). Since cough is caused by the mechanical irritation of the trachea it is nonproductive at onset but as the lesion enlarges and encroaches on the trachea obstructive secondary infection of the respiratory tract occurs. The cough becomes productive. In 12 cases (44 per cent) cough was associated with hemoptysis which varied from slight streaking of the sputum to blood-tinged or profuse hemorrhage. In 2 cases the lesion was necrotic and pieces of the tumor were expectorated.

Chills and fever which are frequent accompaniments of bronchogenic carcinoma are less likely to occur in cases of tracheal tumor.

Röntgenograms taken after the intubation of the endotracheal tube into the trachea help fairly frequently to determine the location of the tumor. Sometimes the tumor may be seen directly on roentgenogram. However, in most cases of bronchogenic carcinoma the diagnosis is dependent on bronchoscopic examination.

The appearance of carcinoma of the trachea is considered below. The lesion may be infiltrating or it may be polypoid and pedunculated. Confirmation of the diagnosis of course depends on the microscopic examination of tissue removed at the time of bronchoscopy.

Carcinoma situated in the upper portion of the trachea is best handled by means of tracheal fistula and destruction of the tumor by electrical coagulation and excision by ligatures. After destruction of the tumor a large tracheostomy tube is fitted to the trachea and the site of the tumor can be inspected at frequent intervals for evidence of possible recurrence.

Segmental resection of a portion of the trachea is indicated in bronchogenic carcinoma by various observers but this carries a much higher operative risk than tracheal resection. The results obtained have not been satisfactory and the results of tracheal fistula and destruction of the tumor by electrical coagulation and excision are more reliable which may lead to subsequent difficulties.

Carcinoma situated in the lower end of the trachea is best treated by electrical coagulation of the tumor through the bronchoscope. The implantation of a permanent tracheostomy tube has been employed in the treatment of the tumor with questionable benefit. It does not eliminate the tumor and the administration of morphine to relieve the respiratory distress is not helpful. In the case of a patient with a carcinoma of the trachea who has been treated by electrical coagulation and excision of the tumor, the results have been satisfactory. The patient has been free of the tumor for a long time.

The best results in the treatment of carcinoma of the trachea have been obtained in cases of early and localized disease. In the majority of cases the prognosis is poor. In most cases death is

caused by tracheal obstruction, secondary pulmonary suppuration or hemorrhage. Although the life expectancy of most patients is between six months and one year there are some notable exceptions. This is true particularly of tumors of the cylindrical type.

McDonald J R Herring J S W and Clagett O T H. M. J. Thorax S. 1945 4 18.

This article is based on a study of 23 cases of hamartoma of the lung. In 3 of these cases the tumor was removed surgically. In the majority of cases the tumor was discovered at autopsy. These 20 cases were part of a consecutive series of 7972 cases in which autopsy was performed. The incidence of hamartoma of the lung in this series of 7972 cases was 0.5 per cent. This tumor occurs more frequently than has been recognized. It is strictly benign and only occasionally causes symptoms. In most cases the diagnosis has to be made by roentgenographic examination. A hamartoma should be suspected in every case of solitary lesion of the lung. Frequently the tumor cannot be distinguished from other lesions of the lung. The specimen of the tumor is examined microscopically.

Although hamartoma of the lung is a benign slow growing tumor it usually is asymptomatic. We believe that it should be removed surgically. There are no good tumors and no growing tumors a menace that it should not be treated. The probability of cure that it can be removed with reasonable risk. Further, the tumor is limited in size. It is usually of the benign appearance of the lesion. There are other more serious lesions of the lung which cannot be distinguished with certainty before operation. In the case of the small peripheral situated tumors, the removal of the tumor is a sacrifice of pulmonary tissue and can be carried out satisfactorily. Lobectomy is not necessary for large centrally situated tumors.



Fig. 1. Hamartoma (right) of case 3. The tumor has a lobulated border.

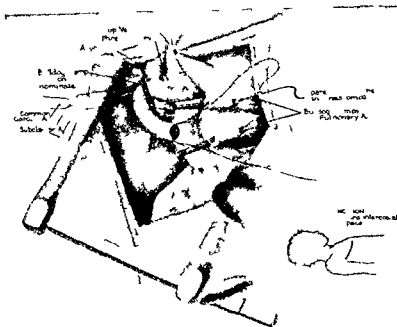


Fig 1. General exposure of the operative field. The right side. The end of the innominate artery is being anastomosed to the side of the right pulmonary artery. The posterior wall features: multiple. The anterior wall has the incision.

ble by with a malform heart as considered beyond the reach of surgical aid. However, in the past three months the authors reported 3 children with severe degrees of pulmonary stenosis and each of the patients was greatly benefited. The results have been sufficiently encouraging to warrant a preliminary report.

These operations were undertaken with the conviction that even though the structure of the heart as grossly abnormal it might be possible to alter the course of the circulation so as to lessen cyanosis and the resultant disability. The cyanosis present in the infant but is also a considerable manifestation of the lung anomaly and compensatory polycythemia. Cyanosis appears when there is a least 5 gm of reduced hemoglobin (100 cc of circulating blood). One of the principal factors producing cyanosis in malform heart is the direct shunt of venous blood into the systemic circulation. L. D. Gaard and V. N. Slykkelist reported that the cause of cyanosis

blood passing through the lungs was no longer in effective contact with the oxygen in the alveoli. These specific pulmonary factors may overshadow a other equally important factor—the volume of blood which reaches the lungs for a rate.

The circulation of blood through the lungs after birth is essential to life. All infants with pulmonary stenosis without a right ventricle and without the closure of the ductus closes off the circulation to the lungs deaethanally age.

Two different types of congenital malformation illustrate the importance of the volume of pulmonary circulation in producing cyanosis. If there is a single ventricle and rudimentary tricuspid chamber usually great vessels are in off with common ventricle and a rudimentary vessel of small size from the outlet chamber. If the great vessel is the aorta and the left ventricle the pulmonary artery the large volume of blood goes to the systemic circulation and the cyanosis is intense. If the vessels are reversed the large volume of blood goes to the lungs for aeration and there is minimal or absent cyanosis. If the pulmonary artery is lost from the heart to connect with the aorta the circulation of the blood to the lungs occurs through the bronchial arteries only and cyanosis is intense. If there are anomalies of the pulmonary trunk with all the pulmonary vessels drain into the right atrium the arterial and venous blood mix and a large volume of blood reaches the lungs for oxygenation. Unless there is cardiac enlargement in the

1. The red cell count of the hemoglobin
 2. The volume of blood shunted to the systemic circulation
 3. The rate of utilization of oxygen by the peripheral tissues
 4. The extent of anemia of the blood in the peripheral tissues
- These factors are shown that in cases with a single ventricle and polycythemia second changes occur in the lungs which will determine the ultimate

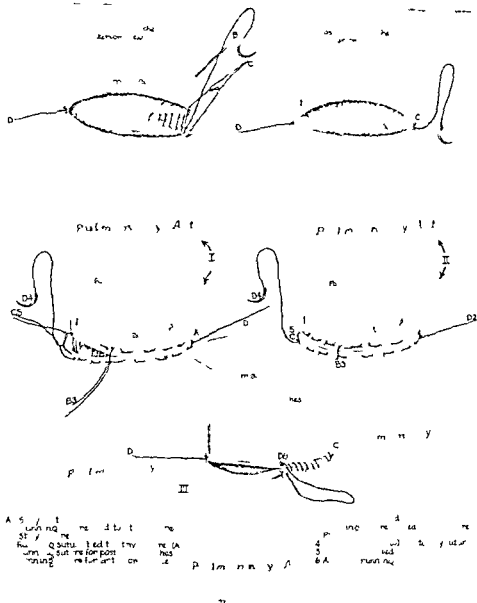


Fig. D. Details of the method by which the distal end of the pulmonary artery is anastomosed to the distal end of the aorta.

right distal end of the pulmonary artery is anastomosed to the distal end of the aorta.

The effect of the anastomosis is to restore the normal circulation to the heart and to the distal end of the pulmonary artery. The anastomosis is made by the method shown in the diagram.

The feasibility of the anastomosis is demonstrated by the results of the experiment. The anastomosis is made by the method shown in the diagram.

that distal end of the pulmonary artery is anastomosed to the distal end of the aorta. The anastomosis is made by the method shown in the diagram. The anastomosis is made by the method shown in the diagram. The anastomosis is made by the method shown in the diagram.

as the ideal vessel to anastomose to the side of the pulmonary artery but later cases showed the innominate artery preferable in patients with a severe degree of anoxemia.

Except for slight variations in the 3 cases the method for procedures was as follows:

Light general anesthesia with ether or cyclopropane was used. The patient was placed on his back with the head positioned slightly elevated (the operation was performed on the other side according to the position of the great vessels and the artery to be used in anastomosis). The incision was made in the third interspace and extended from the sternum to the axillary line. The pleural cavity was entered and the third and fourth costal cartilages were cut to allow the ribs to be spread and the general exposure as in Figure 1. The right or left pulmonary artery was exposed and freed from the adjacent tissues as far as possible. On the right side this was more difficult and necessitated division of the azygos vein and retraction of the superior vena cava medially.

The systemic vessel (subclavian or innominate artery) was then freed and its origin from the aorta occluded with a bulldog artery clamp. When the innominate artery was used its branches the subclavian and the common carotid were ligated at their origins and the innominate artery was cut just proximal to the ligatures. In using the subclavian the thoracic vertebral and internal mammary branches had to be divided to provide sufficient length of vessel. The right or left pulmonary artery was then occluded with a bulldog clamp just distal to the division point of the main pulmonary artery. A second clamp was placed just proximal to the point where the elastic force of the trachea and the upper lobe of the lung. A transverse opening in the vessel was made between the clamps the same diameter as the systemic vessel to be anastomosed to it. The pulmonary artery was not occluded until all preparations for the anastomosis had been made. For the anastomosis fine silk on a curved needle was used. A stay suture was placed at one end and a running suture inserted which was not drawn tight until the greater part of the posterior row was in place. The stay suture was then extended and then running suture into was tied to the stay. The posterior row was completed and the two distal stay sutures. The tension was a continuous through and through suture. The anastomosis was then made. Figure 2 shows the bulldog clamps were removed and any blood was stopped by the occluding ligatures. The lung aspirated and dried the chest walls lost with broad silk to approximate the walls. The chest incision was closed with multiple layers of interrupted silk sutures.

The trachea was positioned in the midline and the chest was closed. The degree of pulmonary stenosis was then noted and circulation to the lungs. Although the procedure was difficult in the infant because of the operation being very close to the diaphragm and the lungs. In the first case (Fig 3) the distal subclavian artery anastomosis distal to the

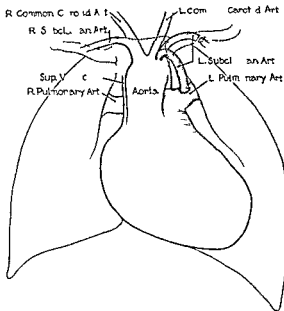


Fig 3. The distal left subclavian artery was anastomosed to the distal left pulmonary artery.

the left pulmonary artery. The patient was a small weak baby who had been steadily losing ground. After operation the clinical improvement was remarkable. The baby's appetite improved and he gained weight and is now starting to learn to walk.

The second patient had a right aorta and it was possible to anastomose the innominate artery to the left pulmonary artery (Fig 4). This patient was deeply cyanotic and severely incapacitated—she was unable to walk 30 feet with uterine tube. Two and one half weeks after the operation he walked 60 feet. He had a while and walked 60 feet back with uterine tube. Before the operation the oxygen saturation of the arterial blood was 36.3 per cent and three weeks after the operation it had risen to 82.8 per cent. The red blood cell count dropped from 7.5 to 6 million, the hemoglobin from 24 to 17 gm and the hematocrit from 71 to 55.

The same operation was performed in the third case but here the aorta was in the normal position. The operation was done on the right side—anastomosis of the end of the innominate artery to the distal of the right pulmonary artery (Fig 5). The improvement was dramatic. The child had been deeply cyanotic before the operation but now his color was good even without oxygen after the operation. There was a marked improvement in his disposition and by the third postoperative week he weighed 40 feet with uterine tube and becoming cyanotic. The oxygen saturation rose from 35.5 to 79.7 in 10 days and by the 10th day it was 83.8 per cent. The red blood count fell from 10 to 6 million with a corresponding fall in the hematocrit and hemoglobin.

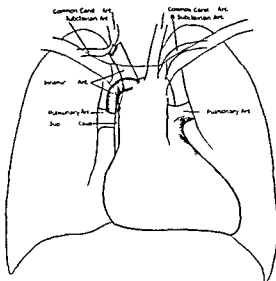


Fig 5 The depth of the innominate artery as nas-
tomized to the side of the right pelvis by artery

- 2 Anastomosis of the dorsal marginal and the
subclavian common carotid artery to the
dorsal posterior pulmonary artery
to the posterior for the lungs
3 Anastomosis of the side of theorta to the side
of the left pulmonary artery
4 Anastomosis of the side of the aorta to the main
pulmonary artery

On the possible complications of these patients, the danger of thrombotic and anaemic states. The implementation of the 3 patients described indicated that it did not occur. As these patients usually have a polycythemia and an increased viscosity of the blood, the authors used a cumulative small daily dose controlled by daily prothrombin determinations to regulate the clotting time to doable therapeutic level. The latest news confirmed a three-week period after the operation and its clinical course. These cases may be considered.

[illegible]

ESOPHAGUS AND MEDIASTINUM

Harper R A L and Tice no E Benign Tumor
of the Esophagus and Its Differential Diagnosis
Brit J Rad of 1945 18 99

Benign tumors of the alimentary tract as a group are not infrequent but are relatively rare as compared with malignant conditions.

The clinical symptoms can be briefly summarized in the approximate descending order of frequency: (1) intermittent retrosternal sensation of dull pain or of pressure or of an aching sensation which was usually referred to the lower or middle part of the sternum but sometimes aggravated by lying on the back (2) epigastric pain after meals or without any relation to food (3) anorexia (4) dysphagia often the intermittent type (5) occasional vomiting or a copious vomiting due to dilatation of the esophagus similar to achylasia and (6) loss of weight.

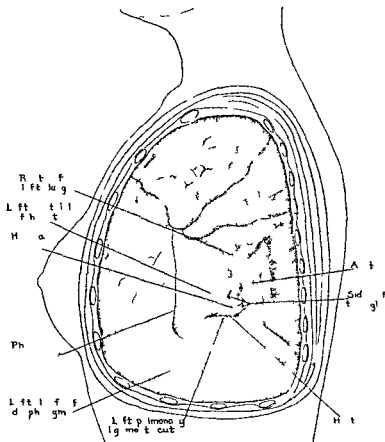
The author reports a case in which the diagnosis of a benign intramucosal tumor of the esophagus was made roentgenologically. The male patient, age forty-one, was operated on and the tumor was found on the posterolateral side of the esophagus. The mucosa was found to be intact. The only pedicle was of avascular fibrous tissue. The microscopic appearance was that of a leiomyoma.

The author concludes from his observation that the roentgenologic diagnosis of an intrinsic extramucosal tumor of the esophagus is a diagnosis by exclusion.

It is obvious that a distinction has to be made primarily between the trans and intrinsic conditions and secondly between the mucosal and extramucosal origin of the intrinsic process.

In the upper mediastinum direct pressure on the esophagus can be exerted by an aneurysm of the posterior part of the aortic arch, aneurysm of the left subclavian artery or enlarged paratracheal or retroesophageal glands but rarely by a retrosternal ganglioneuroma, esophageal polypoid diverticulum, substernal parathyroid tumor or cold abscess of the upper thoracic spine. Indirect pressure may be transmitted by the arch pushed posteriorly by an aneurysm of the innominate artery.

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f Stru t b d g th tn gul p bo th h t

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mortality high benign glioma of the
 with the race of the

R. E. R. B. LO. M.D.

MISCELLANEOUS

Savage O. Pulmonary Concu- sion (Blunt) in
 the Anterior Thoracic Wall. *Lancet*, London
 1945, 48: 444.

Complete amputation of the right breast of 87 battle
 casualties who had sustained a thoracic wound.
 Most of these patients were unconscious while
 under observation. They had sustained a lethal
 of the chest damage so that the pulmonary hemorrhages
 which were present were unexpected but
 even in the late cases in which clinical signs of pul-
 monary abscess were present we particularly looked for
 the wound of the chest. No further patients had
 hemiparesis. The patient was not lightly regarded
 and the blood pressure was the normal limit.
 Symptomatic distention of the chest was breath-
 ing present in many cases. Physical signs in the

chest were minimal. Roentgenography pointed out
 the collapse of the right lung in many cases. The
 shape of the chest rather than the position of the
 hemorrhages found at autopsy was

In the majority of cases the lung was collapsed
 no change but the pattern of the hemorrhages was
 seen on section in many cases the hemorrhages had
 coalesced to form a confluent flat nodule
 the lobes of the lung and the post-operative
 phenomenon. The distribution of the hemorrhages
 though tall but uniform from periphery to
 hilum. If hemorrhages on the parietal pleura and be-
 neath the visceral pleura were present in the
 cases.

In patients who have been posed to bleed from
 the central chest we were that the wound was
 whose pleural tear is slightly raised and where
 blood pressure is within normal limits. The
 situation should be given the possible presence
 of unsuspected alveolar hemorrhage.

S. M. KARN, M.D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Howe J T Eperi nees w th th G t o pe
e a P riod f Six Yea S uth If J 1945
38 93

After 3 years experience with the gastroscope
Howe emphasizes the use of the instrument
enables the examiner to easily palpate the
the rectum stomach Most of the gastric
tumors can be palpated as well as some gastric
ulcers and gastritis

Gastroscopy is an adjunct to the gastroscopy
lesion of the stomach The author believes
that the diagnosis of chronic gastritis is not
but ally not for at clinical importance
B JAMI GOLDMAN MD

Smith C S Wik ff H L nd S th rd B A
G tri Acidity in App ntly Healthy In
di ldu is Am J D g i Ds 945 17

The authors present the findings in a series of
fractional gastric analyses conducted in the past
fifteen years as a part of the fundametal course in
physiology and chemistry at the Ohio State University
College of Medicine Fifty normal healthy students
served as subjects The gastric contents were collected
in accordance with standard procedures for feeding
of either the Ewald or the alkaline meal Gastric
data including the maximal titl acidity the maximal
malformic acid hydrochloric acid the time of occurrence of
each of the phases of the curve of the titl acidity
were thus obtained Comparisons were made between
the normal so-called normal values listed in the
textbook data the subjects obtained from the study
of the group of 50 healthy subjects It was found that
the variation in normal gastric acidity was far
greater than the standard textbook data

The majority of the standard text books give the
values for maximal total acidity varying between 40
and 60 degrees Considerably lower values were
found in 38 of the subjects reported in the present
article the values being between 10 and 60 degrees
The maximal value for any subject 90 degrees
More than half of the total number of subjects
reached their total maximal acidity by the end of
forty five minutes instead of fifteen minutes as
in many studies as given in the textbooks The
maximal values for free hydrochloric acid in the
subjects reported agree with the textbook values
some have been found to be lower for titl acidity
In subjects with maximal free hydrochloric acid
between 90 and 95 degrees that in the textbook
values differ by 2 to 7 degrees However the total
amount of subjects 8 reached the maximal value
less than the study minute interval and the
normal

Section results and suggestions he compared
each other and with the published data

ards a further investigation as conducted in which
a few individuals were used repeatedly as subjects
for fractional gastric analyses These persons were
in good health and had no gastric disturbances He
again considered variation in the gastric acidity of
the individuals subjects was shown by repeated analyses
of the same subject carried out at intervals of a
few days
Marmas J Server MD

Arora A H Inflammatory Lesion of the Upper
Gastrointestinal Tract J Am Med Ass 1945
127 1 27

This was a paper presented before a joint medical
and surgical meeting in which the author discussed
certain advances in the diagnosis and treatment of
lesions of the stomach and duodenum that have
taken place in the past few years

Since it is important to assure a patient with an
ulcerated lesion of the stomach when complete healing
is present the author suggests the following criteria
for healing of ulcerated lesions of the
stomach (1) complete cessation of all symptoms (2)
maintenance of normal gastric function (3) persistent absence
of occult blood from the feces (4) disappearance of
the anemia of the iron deficiency and essential factor
type (5) normal sedimentation rate (6) re-epithelialization
of the gastric mucosa (7) if it is
possible to obtain confirmation by gastroscopy
Only when these tests are repeated over four to
six weeks period of observation can we be sure that the
lesion of the stomach has healed and the mucosa
healed and thus most likely to be benign If this
does not occur the patient is entitled to surgical
intervention

For dyspepsia St John's outly amended by fluoro
scope the stomach and duodenum of 413 patients
without distress symptoms and found 54 with
deformities of the duodenum Some presented as
but the majority had cancers of the duodenum 7 had
cardiac symptoms 5 had diaphragmatic hernia (2 very
large) 2 had stomach cancer 1 had a lymphoma
of the stomach and 1 had a gastric polyp
Many functional abnormalities of the stomach and
emptying time also were revealed The author
believes that the routine examination of the upper
gastrointestinal tract may in time attain the same
importance as the study of the lung

Bird L m p a d M y c l l e t e d 243 p r e d
case of peptic ulcer in children in a patient
ranging from infancy to 15 years of age
who of acute nature with duodenal ulcers
between the ages of five and fifteen years
revelled that the child was like those adults Of the
13 children 10 were male and 3 female
five of the ulcers were in the duodenum
The children desired the same diet as the adults
with continued digestion but the children
their proper gastrointestinal tract studied by means

Let sh wel that 4 p r c n t f th j t nt
t at l s ha g l e n i g n g s t r c u l c r j o e d to
h c a n c r The p t i e t s r e s p d d l l t c o n
t e t h r p a t i r t l o s g t h s y m p t o m s a n d
g n n g p s l v l o s t i g h t O f t n t h l s n
a p p e a d t d m n i s h i n s z e n n t g n a n d g a t o
s e p a m n a t n s O c c a s i o n a l l y s u c h a n l e e
p r e o u s l y d e m o s t r a t e d b y b o t h m e t h o d w a o t
r c o g z b l i f t e r m n t h f t a t m n t I t
d i f f i c u l t t o p l a n t h e e a r l y b e h v o r o f o m
m l g n n t u l c r a t o n f t h e t m b T h i m p o v e
m e t i t h r e g a r d t h e s y m p t o m s a n d i g h t o f
t h p a t i e n t s e s e t u d r s t n d n c w i t h b e d
r e s t a n d n n r r i t t i n g f d s e c o n d a r y n f l a m m a
t r y r e t o s a l l e v a t e d G t i t i s d i s a p p e a r s a n d
c o m f r t p l a c e s p a i n g a e u s e u c a t i n s n u s e a
n d a r e a T h d e c e a s e n s e f t h e l e r a t n
m a y b d t t h u b s e n d o f n f l a m m a t i o n
b o t h u l c e P o b l y t h c r a t e r m y b l e f d
b y g a n l t o n t i s s u e a c t u a l l y b y c a n c e r c l l s

In o r d e r t a a t b t t d a g n o n t h e e a r l y
m l g a n t l e o n s t h a u t h s t d d l i o r d s f r
c o m m f a c t r s p e r t u n g t h g u p o f p a t i e n t s
H l f l i n f o r t o n a s d e n d g r a m a n l y s i
f t h l o c t o n f t h e l e t h e a g o f t h p t n t
d t h e d a t i o n f h s s y m p t m G s t r i c n a l i s
p t c u l i y a s r e g d s t r e e d t y n d t h e o f
t h u l c e t n w s l e v a l u b l D t n c e n g
t h t y p d r a d a t i o n o f p a i n a n d t h r t o f l e l
g t h c o r v a t e t h p y e e f n o v l
U l a t o n t h i r m e d t c m f t m a c h
p x m a l t o t h p y l r u s i p t o b e m a l i g n t
g a d l s o f t h e s f t h e l e n T l a s t r u e n
65 p c n t o f t h e t r c N a r l l u l c e r s
f t h g a t e r c v t u a n d t h e f n d u o f t h e
s t m c h a r c a n c U l r s n o l v i g t h e n t r
p o s t r w a l l p e d t b a n c r n a o p e c e n t
o f t h c a s l i f t h l i s s e r c u a t u r e
t h o s o f t h p y l o r u t e l f h d m a l g n y n o
p c n t i n a s m u c h o c h l f l u l c e t n s o f
t h t m c h o r g u n t e o n t h l r a t t h
t h f u d t h a t m o t o f t h d g n t i c s
c e l t h r e g a d t o t h e l e o n s f t h s r e g n
P t n t s w t h l e r a t i e l i f t h s t o m c h
f t r m i d d l f e l i g h l s y m p t o m s f i l e t h
y r e f i e t m e s m o r e l k l y t o h a c r c e
s t d f u l c I f o n t h e o t h e h n d p a t n t i n
t h a g o u p h a d h a d s y m p t o m f i n o r m o e
y a r s t h v e w a s t E v e y c l n h o u l d
s l c n d e a y p t e t h a p p a l s o f d
c b t a n y d g t o m p l n t t h a t b e g s
a f t t i g f f o t T h d g o s f m a l g n o c y
m t b r u l e d t y a l l f t h a d t r d p l
H a l a t l e f t h s t m a c h i s d e m
t t d d l t h p v h o l d l s t u t e d n
a s t b l a g m t c a n b m a d I t n t h
t y p f l i n p a t c u l y t h t p a l l a t e m a r s
m v c o f t h e t e s s e d l m o s t n d r o u r
J e s n a l y b l e c a n c e m y b m h o p e
l l y p e r a b l e
T h s e o f t h u l c e r m y b m l a d g c a
e p r e s e n t z l e t h a t l s t h m

i n l a m e t e r O n t h e o t h e r h a n d n o m o u s b e n g
l s i n s g u n g t h e c l i n c a l i m p e s o o f u f o r a l l e
c a n r h a v e b e e n c o u n t e r e d W c a n n l y u
m i s e t h a t t h e l e s i o n s b n i g i n t s m l l n e f t
i s i n o o f t h e s a f e o n e s i f i t o c c r s i n y u n g
d d u l s o f i t i f o n d n a p t i n t i t h y m p
t o m f r m n y a r

F e h y d r o c h l o r i c a c i d w s f o u n d i t h q u a l
a b u d a n c e i n t h e u l c e r c a n c e r g r o u p s i n t h
g o u p w i t h d e f i n i t e p d b n g n u l c r O f a
p a l l e l g r o p o f p a t n t s p r o v e d t o h a v e c n c r o f
t h e t m a c h 60 p r c n t s h o e d n f e h y d o c h l o c
a c i d o n g a s t r i c a n l y s s T h e r e f r e t h p r e s e c e f
f r e e a c d i o f l i t t l h e l p n t h e l i f e e n t a l d i g n o s i s
T h a b s n c c f f e e a c i d h o e r i s d e f i n t l y i n
f a v o r o f c a n c e r

T o o m u c h l a n h a s b e n p l c e j o n t h e a m o u n t
o f p a n a s s o c i a t e d w i t h g t c u l c e t o n s T h e
c o m m n b e l f t h t p a i n i d e a t e b n i g n u l c s
e o n e o u s M a n y o f t h e u l c e s i n t h a u t h o r s
e e s t h a t p r o v e d t o b e c a n c r p r o d d p a i n t h t
a s l i d b y f o d r a l k a l i e s n a c t l y t h e s a m e
m a n n e s a n t h e b n g n g p E e n f a n u l c e r a t i o n
h a p p a e n t l y h l l a f t e r o c e m t h a n i d e l h o
p a t a l t e a t m e n t t h r e h l d l a c f l r x a m
n t o n f t r f o u r o s i w e e k s A n y e v i d e n c e o f l a c k
o f c o m p l e t e h e a l g o r t u r n f u l c e t o n h u l d b e
n s i d e d s u f f i c i n t t w t a l y s u r g e v

I n t h e u t h r s g u p o f q u e t i o n b l l s n s i t
w f u n d t h t h r e r e c t n h a d b e n d o e n t h e
d a g n s s o f b e n g u l r o n l y t h t h p a t h o l
g t f i n d t h a t t h l e i n w a s c a c e t h e f i v v e a
c r a t e r s e d t o 40 p c n t I t q u i t e v i d e n t
t h t t h u r g e n h l d i n c l d e t h e n d a l a s
h i e s t o n s f o l l d u b t f u l l e a t i o n T h i d d
l i t t l e t o t h e h a r d o f t h e p a t n a n d g s t h
p a t n t h b e t c h a n c e f o r c u r e I t h o c l e t h t
w s h o u l d m c f q u a n t i t y m a k e a l r r e s e c t i o n
O f t n a s m p l e t o t l g a s t r c t m y v h c h l n i s t s l
t o b e t t r l m n a t i o n o f t h n o d l e t h n m n y
s u b t o l l t n s c a n b e d o n f e l y T h s s t r u
p a r t i c u l y w h n t h l y m p h n d i n t h r g n f
t h l f t g s t c v e e l a p p r t b v l e d T h
g r a t o m e n t u m c a n b e s f e l y e l i m i n a t e d a n d n e
e s s q u i e h a e s u l t e d f o r i t s a s s n c e

O n s h o u l d n o t b e t e m p t e d t o d a l l t i v e s u r
g y f r g a s t r c u l c e r I n a g u p f 3 p t i t s s u b
j e t d t g a s t r o n t r s t m y v t h o r v t h c a u t e
t e a t n f t h l c t h e w e r a h o d d f
c a n f t h s t o m a c h T h i s s h s t h a t e v n p e
n d u g n s c a n n t t e l l b y t h f e l o r t h a p p e a r
n o f g t c l e e h t h i t s b g o r m a
l g a t

T h t h b l e s t h a t e l y r d c a l u r g y
n d c t d v h n p t n t p p e r s f t e a t m e n t i t h
l c f t h t o m a c h i n t h p y l o r f u n d a l
g n s I f h e i s o v r f o t y y e a r s f g a n d h a d
s y m p t m s f l e t h a o n e j e a i f s l e r i o v r
z c m d m e t r t h m d i c s h u l d b e g v e n
I f t h p t e n t i s y g a n d h a s m l l e s o r
f t h e u l c s u p e m p o d n s y m p t o m f m
t h n f i v y d a t o n a m e c o n s r v a t e t t

id ju t n ble This patient sh ld n t be tr ated
an mb latory fash n as s common practice
m l k or e l d de l ulcer b t sh uld be g n
th b n fit of n adeq t hosp tal r g m If the
ul r r m ns en part ll unh al d aft r
n nth f s h therap if th re is a etu n of
ulc rat n e m th ft heal n i p p a e t then
th pat nt h ld be g d to subm t to s gery
J R R K N A R M D

Schwa t S O L g lty ith M t rati Ca ci
n ma fth Stom cl t I I M 94 277

Th r s cons d rable den e that care oma of
th t m ch m y m n f t its lf as a d a e of
ma led ch n c t S b e q e n t meta tases
(espec lly that f th bo e) h e the d n
rd cours i t t d to be el t ely rap d F r
th e on perat epr cedures fo th ll t n f
th pr mary l r d t ken ith reluct nce
h n m tases a dem n t abl The auth r
po ts a ca e w meta stat c a cinoma d m n
st ted n the bo ma o th e s ars b o e d th
t copen fo q estion the val dity of e t m e s g i
cal con rvat m th prese c f metastases

The patient ginally pr s t d h m s lf with the
histo y fa p e t cul of nteen ye rs d rat
hich h d man fe t d t lf by pa nd bleed g
It is impo s ble to as rt n f m the h t r v wh n
thet ansion fr m th beng n c d t n to th mal g
nancy h d tak n pla Th o lb ght l ant
dat gh adm on by thr four m nths w th
first clinical lue that ign fica t ch g e h d tak n
place It imp obabl h e r th t th wo ld
ha e been s ffc nt m t f de l pment f the
m t t a e s The h m al g cal f d g on th
ad m s on e com p t ble w th cut bled supe
umpo d n chr n c bled thout east ng lght
n the natu of th nde ly ngles on Th bs e
ff e a d d th p e s e c f b l d m th g s t c
cont nts as well as th perist t cult blood in th
tool allsugge t d mal g cy It on hca t that
neither gast oscopic n r oentg n gr phic am
nation rev led the les n e n though t p e s e n t
th time was conf m d b the f d ng of m t a t a s
It ho n two thy that n bland det nd r
placement therapy (iron) th blood findings became
no m l with n a el t v ly h t p e r d f time
Tho gh details in the int rval re na a bl n
d cal cha g e had p p a e n tly tak place d r n
the tw nd one h lf ye per d bet the
pat e t s first h p it l admission and th p p e
n f r m n n t sympt m hich e c p t thos
da y t e t n s bon d trut w e e s m i
la to th original It is mewhat s rp us ng th t
the blood sh ld h m ed t n de q at l l
n p t of e p des f ble d g d mark d a d is
plac ment of th bo m row and sh uld h e
completely lacked th h r a t i s c s rd n a rly
a oc t d w th m l p h t h c m a s

A f t e f c o v d e l e l m c a l n t t th
tra t n f m th t n t th m l g n t charac
teri t o f the l e e t n t i o n o r n a lly r l i n g

its lf cl cally by t n a blee! At th t m
th les was sm ll (o p l c e d) t b e n l
co erabl by ith roe t g r a o g a t o s c o p e
examinat n a d y t i t h d a l i m t a s t a z e d t
th boness t n s l a s t b e c t l g c a l l y d e m
trable Of m ch m m p o t n c w the be a n
co r s e f t w nd n h l f a p e r o d f l l
th d m n t r a t n f b n m a m e t a t a s Th
e s t h q e s t h t h t m s g c a l c o r
t m i j t f i d i t h p c f l m t r l l
m t s t a s e s h t h o p t e t r n t
m g h t b e a d c a t d f t h l l a t o f y m p t m
It wo ld p p a t l a t from th ngula ca
that prima g cal i o c d u h n o t h m
and catel a e j s t i d n though arlv m t a s t
re d m n a s t a b l J t K N M D

Appl by L H P t perati S r v i v l P i o d l
G strolntestinal Ca ci m C d M l
J 94 5 48

Of 3 S p t n t theca m of the r ctum 4
were op ated a d 8 f th e l f t h o p t a l
w th r a s a b l p p e c t f g c l c e T a t
one of the 82 h d f e years b t m a y
m e a r s t l l a l g t m n v h a g h a n o p e
a t d w th n l t h e y S v l a r l
aft ten y a r s d p a t n t h s v i d f o t e e n
years a d g l h l t h

Of 37 ca s f c a r c o m of the s g m o d 96 w
xpl d On hund d f the s l f t h o p t a l
i t h a p o s p e t f i c u F f t y f r o f the s pat t
are t l l e 34 d t y e r s m o r a d
m y o f the m h l o n

I 81 ca s f c a c n o m f t h t r r d d
c e n d i n g c l t h e s l t h b e n p o e
S e v t y e n p t t s w p l o r d n d 36 s
i d r s t i n O f t h l t t l y 9 e k n t o b
l i t f i c y a r s

Fifty n f 62 ca e s f c a o m of the c u m
and c e d n g l n e p l d a d 44 w e
e c t d Th t y e i a t e n t s k n o w n t b e a l
d o f t h 24 h a r v i v d h y r s m e

All 6 cases f p m a r y c a c n m a of the s m a l l i t s
t n e o p e a t d n Th e the t n s r p a t
f t h d n m t a t d b y p a l l i a t e s h t
c i r c u t Th e e i n t h m b l s g m t s f the s m l l
i n t e s t i n e w e r e s t d T o f t h p t n t s a
a l e f t s u x y a r s the t h e r a f t e n t e
m o n t h s

Only 93 ca e s of 684 f c a c o m f t h s t m c h
w xpl e d Th o t h e 49 ca s f f d n o p o s
p e c t f c u r O l y 3 c a s w r e s t d w t h
p o s p e c t f i c u r T n t y f l t h p t n t s u
v d Th l g e s t p e d f s r v i a l g h t n
m o n t h s a d t h a g p e d w a g n t and n
h a l f m o t h s A y p e t n j l t i
c a r c i n m f t h e t m a h a s d g Th m o
t a l t y r t n e s c t f t h s t o m a h f c a n c e r i s
4 p e c e n t e s t n f l e e r th c a u s
t i s 3 p e c t Th i s d f f c e i the m o t l t v
r a t e i n t h h a d f t h m s e m u s t b e i n
t r i n t t h e d i s a s a d n t t t h e u r g n

In carcinoma of the gastrointestinal tract, resection of the stomach, the resection has a 36.6 per cent postoperative survival and gives a 3 per cent chance of survival for over five years. The results in these figures are a reflection of the

S. MUE, K. H. M. D.

And rs n A C Slut ky B nd M t R W
Effect n G tri S cr tl n of Pedi le J unal
G ft in th Wall f th St ma h G t
t gy 945 4 3 3

The authors report that no inhibition of gastric secretion by acetylcholinesterase inhibition was observed following modification of the gastric mucosa with a 10% formalin solution. In a previous study, the authors had reported that the gastric mucosa of the rat did not inhibit the normal gastric secretion.

The animal used this today we found
 a dog of both sexes maintained a
 mixture of cold dog food and me
 scraps. Water was available except du
 ring the last hours of a fast period and when
 the animal was used today. Before guid
 ing the animal was fasted for twenty-four
 months preceding the test.

After determining the normal gastric secretory response of a male duodenal conditions of the study the males operated upon for the purpose of applying a pedicled jejunal graft to surgically pedicled duodenal stenosis. The dogs were allowed to rest for at least three weeks before being used in the study. At least fifteen separate gastric analyses were made in each animal after the operation. Simultaneously the completion of the studies the animals were sacrificed and subjected to postmortem examination.

B. VIAND G. v. M. D.

Mar h ll S F A Pl n f th S rgical M nag
m nt f C t j jun ll Fi tula A S g

Int st n th r us p bl m f gast j ju o
c h c f t l a was t mulat d by th h gh pe t
m t l t y r p o t e d i n 935 f y Lah y a d S t n
wh g t e m m e d a t p t v e m t a l d s 63
p r n t n 8 c a e I n 938 L h e y g s t e d a t w
t a g o t p o c e d u r o d e r t o a v d t e l g h
p e a t v e r i s k . The first pat t p o n w h o m t h
p l a n w e m p l y d w s s s f u l l y p r a t d u p o n
1938 a f t r w h c h t h o p e a t m t h d w e m
p l o e d 14 c a s s w t h r d a t h m o t a l t y o f 7
p e c e t

Gastr jejunocolic fistula most commonly occurs following perforation for duodenal ulcer and usually is the postoperative complication of peptic ulcer gastroenterostomy. It is the foremost problem when a postgastroenterostomy jejunocolic fistula is the anatomical lesion. The diagnosis is made on the basis of the mesocolic and pelvic shadows of the small intestine on a plain film of the colon. Most of these patients are very poor dieters. There is

made in nutrition with the alteration in the
protein and blood chemistry which makes every
tentative operative procedure unsafe and unwise.

Experience has demonstrated that in order to prevent recurrence of lesions in any complicated ulcer case a radical subtotal resection of the stomach should be employed. In addition the fistula should be closed. However, an extensive block dissection of the fistula tract is not a suitable gastrotomy and taken in one stage is too hazardous and would certainly result in high percentage fatality. The procedure used at the Lahey Clinic Boston consists of an operative in which the first stage is designed to permit egurgitation of the small intestine and colonic content into the stomach and jejunum. This is followed by dissection at the Lahey Clinic. This is accomplished by dividing the terminal ileum and performing an ileocolostomy between the terminal ileum and the descending colon. Following this the contents of the small intestine and right colon are emptied into the descending colon and they cannot return to the stomach and jejunum. Subsequently to this first stage procedure the patients have tended to gain insight and almost certainly have accomplished cessation of the diarrhea. The patients are now sent home for two to three months after which the second stage procedure may be done when the state of nutrition and general condition are improved.

In th s co d t g th cec m ht c lon nd
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All of the patents have been paid up
with the school and the national conference has been
latently notified after the extension of the
section. Sincerely, J. Fogels & M.D.

Gl	n r	C L	D stu	ban	in the Suga	Met b
ol m	ft	Subtotal	G	t ectomy	Am J	D
g t D		945	57			

The absorption of sugar in man and animal is mainly taken place in the small intestine. In the stomach, chyme is not absorbable because of the presence of the pepsin, fatty acids, and other substances. The process of absorption in the small intestine is very complicated. Experimentally, it has been found that (1) sugar is absorbed in the duodenum and (2) the absorption of sugar does not follow the simple diffusion.

In no small and valuable the time has not left the
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J a K N MD

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Th h f t th ra ga t et mv
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e ph g ga t r o t n as d t
S w J Foc l s MD

Gray I. Tr. ma In Relati n to P ptic Ulcer
J. S. I. J. W. 945 4 887

The a th r t t e that i r m tal k
nim l r p o t d l y u s a th ould d cat
that d ct trauma er th r g o f th stom ch
ca b follo d b v th pres nce facute peptic l r
Ca e h storie e p e e t d n h ch a ute peptic
l r s p forat d g tr c u l e r s and perforated d o
d n al ulcer r lue t t a u m Other cas re
p e s e t d n h ch p r e t u n g peptic ulcers e
aggra t l b y i n j u v s r v e l d b y r u t n e a c t i
t o r agga a t l b y c e p a t o n a l f c t o

Fr m the c e s c t d the u th r concl d s th t
cute p p t c ulcer m y f l l o d c t i j r y to th
uppe b l m n The c i s l e n c to i n d c a t e that
complete h e l g o f a n a c u t e l e e c a n a n d d o e s o c c u
D a t h m a y f o l l o w w h n t h e a o b r u g f t h
m e s m e m b r a n e i o c a t l w t h e r o n o f t h e
t l e s s l s i n j u r y to the g t c m u s m m
b e s b m c o s l h m o r r h a g m v c u s t h
c o n q u e t d g e s t i n f t h e j r d p a r t T h e e t h t
o f t h p a t h o l g a l p o c e s t h e g s t i c a l l s
d e t m n n g f a t n e r l a t to the c o m p l i c a t i n
that may a i s

The q e s t i n s t o w t h t a s g l t u m a
s c h d i c t b l o w to the e p i g a t i m c a n p o d c e
a c h o c u l c e of the s t o m a c h a n d d u o d e n u m a
d b t b l e s u b j c t I t h a s b n e s t m a t d t h a t a b u t
s p e c n t o f t h e a l t p l t o n h a e o h e h d
g t r o d u o l l l t o I n o m e f t h e s i d i l
l t h u l c m y j i b l y b e d o r m a n t r l e n t I n
v e w o f f c t h t t h e m u c u s m b n e f t h
s t m a c h r e g e t e s r a p d l y a n d t h a t c a l e p i
c e h s t h t l e r m a y s t w t h u t v m j o m
a j a s s u m p t t h a t a s g l d i c t b l o w c a n a u
h o n e p i t e l c s e t l y h y p o t h e c

L i g d M o l n h e s p e c i f i d t h f l l w g
p o s t u l t e s t h t m s t b e f l l i d b f t u m c
b h l d a s t h e c a u s f l e c r () p f m t b e p e s
e n t f t h b e n c f g t r e d e p t h t
c e d t () t h t r a m u t b e e r a n d l a l
e d t t h e p g t e g n (3) t h e n t f v m j
t m m t b i m m d t e a n d (4) t h s y m p t m i
g n s t f l l m t p o n t g t r e l c
l p t e l c m a y t w i t h t a v l l v m j
t m s w h a t o e P f o r a t h m h g e m
b t h f r s t s y m p t o m g n f c h o n p p t i c l e e
T h e f f c t f r a m a v g c a c a l y b
e l t l f t a t h o g h a n l y o f t h h t o r y o f
t h c d t n a n d c m p l e t e a m u t o f t h
p a t t H i F T x M D

t l M S t n l f t h S m a l l I n t i n f m t h e
C l e a t i n f l l t d I n f l m m t r y L e
i B I J S z 945 3 37

F c a s e s f b s t r u c t n f t h e s m l l n t e s t d
t s t c t r p o t e d A s t h c c t n t f t h
l l t e s t f l i d n s d r a b l r w g
c e s b e f s y m p t o m s p d d d t
d b t b l h e t h o n t a o l t l f l m n t y
l f t h s m a l l t e s t e l d p l s y m p t m s
a p a t f m t h o s o f t e n o s i s I n m o s t c a s c t

J g o s o f t h e c a u s e f t h e s t n i i m j o s i l e
l f r e o j e r a t

The s t e n o s i s f t h e s e c c f u n i t b d u
t t b r c u l o s s t r i c t u r e a n d n c a e i t w s d e t o
C r o h n d a e A l l f t h p a t i e n t w e S i n g l a h e
m l e s A t l a p o t m y t h e f i n d i s v e t y p i c a l o f
b s t r u c t i n d i n m f t h e c a s e t h e g
p p e a r a c e o f t h n o t c e a r a i n d c a t e d t h e p a t h
l g c a l b a s f r t h e t r i c t e A t b e r c u l o u s u l c r
c u e a c a r h i c h p e d r e u m f e r e n t l y a r o n d
t h b l a d s m a l l t u b e r c l e s m v b e e n t h e
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C o h n s d e c e s m l k l y i f t h e c i s i l e m e n t
f a p p e c i a b l s g m n t f b o e l b t h s c o n d
t o n m i g h t h e c f e d t a m a l l a r e a T h e h i s t o
l g c a l d a g o s o f C r o h n s d e c e i m a d e b y
e x c l u s i o n i t h a b s c f t b e c l s g a l t n
t s e m a l i g n a n t c h a n g

O p e t i c e l e f f i c t e f t h e m a l l i n t e t i n e
b t a i n l b y s h r t r c u t i n g t h s t c t u b y m a n
f l t e l t m a d w h e n s t r i c t u r e r e p r
s n t s a s c a r o f a h e a l p e d n t f c t n s u c h t e a t m e n t
l l c u t h e p a t t w t h t h e m i n i m u m r i k W h e n
t h e r e i p o s s i b i l i t y t h a t t h e t r i c t s f m l i g a n t
g n o s a s c a t e d t h a c t i c i n f l a m m a t y
d e r e c t o n a d a n a s t o m a e i d i c a t e d
J R V L L i D Q U I S M D

Koch V W n d F c l e W A Duodenal Ul r
with Perforati n f l l w i n g a C u t a n u B u r n
I I I M 94 2 7 9

A l t h g h d o d e n a l u l c r s f l l i g b u r n s h a v e
b n d c i b d p r e s l y t h e t e r m C u l g s u l c r
b b e n a d o p t d l a g l y b e c a u s C l i g c o l l c t n
o f c a s w a s t h e l a r g e s t y t p b l h e d a d b e c a u s
h i s o g a l p p e r d s b e d l e i o n s o c c i g s p e c i
c a l l y i n t h e d u o l m t h e i t e o f t h g r e a t m j r i t y
f e p o t e d c a s e s

S t a t i s t i c s v v g e a t l y a s t h e i n c d n c e o f d o
d e n a l l e r s f o l l o g b n A n x h a t i v r e i e v
o f t h l i t e t e b v H k i l e l h m t t h c n c l u s n
t h a t t h v a g e 3 8 p e r c e n t p o b a b l y n e a t h e
c t f g u r f t h e i n c d c e f u l c e r s f l l w i n g
b n s T h s l e c e r s a r m t c o m m o n i n c h i l d r e
t h a v r g a g i n C l g s r b g t n n l
g h t t e n t h y T h e u l c r a t n m a y c o c c u r t a n y
t m e f o l l o g t h b n I s t n c e s f u l c e r a t n
c o c c u r r i n g a s r l y s e i g h t h o u r s a n d s l a t e a s
c h u n d e d d y s h a b n e p o r t e d

T h c a c o f C l i n g u l e i s s t i l l a w a t g
p e r m a n t a l p r o f T h e t h e o r e w h i c h h a v b e e n
d a n c d e i m e d o n l y b y t h e n m b e f o b e r v
r s T h o s e r e c v g t h e m o s t s u p p o r t a e

C l g s u g g e s t e d t h a t B r u n e r g l a n l w c
c a l l d u p o n t o p e r f o r m t h c r t o r y f a c t i o n s f
h c h t h b n d k a s c a p c a t e d

T h t c t h e o r y u m e t h a t a n i c a r d
t t h n t e s t i n s b t h b l d

3 M c L a g h l s p e r m e n t l k f p a r t l l y
d m a g g t h e a d e n a l g l a d f d g s f l l e l
l e r a t n t h s m l l b o l f 7 f t h m l u t
l e r a t n f t h s t m c h w s b e l

4 The mb lch th ry that th f r ted ar a b c m s n e r t i a d f l l a y i s i d t h a b e n s u p p t d b y B i l l r o t h O t h r s h e v e r h a v e c a l l e d a t t e n t i o n t o t h e f a c t t h a t e m b l n v r c c u n t h e d o d e n u m w t h u t c c u r g a l o i n t h e s t o m a c h a d p i t u t a l o t h t t h e o b t u c t e d v e s s l h a n e v e b c n f u n d

5 Th b s e q u n t d v e l o p m e n t f d u d e n a l u l e r s f l l n u n f c t i o f t h e b u n e d r e a h a b e n n o t e d b n n y

6 A n c h e l n d O l o n n e l d f o m t h e p r m t l b t h a t c o m p u n d s o f t h e n a t u e o f a c t y l c l o i m a y b e l e t d b y t h b n o f a c t t h a t y l c h l e s p l t t n g t r a s m a v b i h b i t e d b y t h e b r

D u d n l i e r s f l l n g b u n s a g e n e l l y n g l b u m y b e m u l t i p l e T h r l o c a t i o n r s T h e l c s r y n s e i r p m t h t o f a p n e d t a q u r t e r T h a m o u t f t u s e l o s t m a y b g r e a t a l i g h t a s n o m e c a s e s t h l i n u s b u t a m r e o e n v h r e a n o t h r t u s p i d l y s l u g h g p e r f r a t e p o c e T h e s h a p o f t h e u l e r i s r r g u l r a n d e t a t e o l g n d n a r o c c a s a l l v c l a T h e d g e s a s h r p l a d e l n l y c u t t h e b s i s c l n a n d g r a i h a d t h e r m y n t b m u c h n l m m a t n a t t h e m a g n I t s f r e q u e n t l y n l s h a p e d b c a e o f a l s s f m o r e m u m e m b a n e t h a n o f m u s c l t e T h e u t c o m e i s p e r f a t i h e m o r b g o s p o n t a n u h e a l i n g

T h a u t h o r s g t a a e f c l g u l c r n i t y e i g h t y a l d m a n h i c h o f p r t i c l a i n t e s t b e c a u s o f t h f a c t t h t h b r n s t f g t e x t e t b e c a u s e t h e n o p m o n i t r y y m p t m s o f t h e d l o p n g l c e r a d b s e f t h e d a g n t e c d i f f i l t e n o u n t e d d u t o p r v i u s c a r d i a c a n d g l l b l a d d d i s a s T h e f i r s t g n s i n t h f m f a s e a d e m e s p p e a d o t h t w e n t y t h d a y a f t e r t h e b u r T h c l n c a l p t a e a p p e a r e d t b t h a t o f c u t e c h o l c y t t a c o n a r y a t t a c k a p e r f a t e d v c u s T h p a t e n t e p u r e d t h r e d y s l t e

T h e a u t o p y e v a l d a p u n c h e d t o n d h o l 5 m m n d a m e t r f t h a t e i o u p e o a s p e c t o f t h d o d e n u m j s t a b o t a t t h e j n c t i o f t h p v l s p h c t r a d t d g t h r o g h l l c o a t s f t h e n t e t n e T b l e s h o d n i n f m m a t o n a n d l i t t l d e n e o f f i b o a d c a i g A b u t n c h d t l l y t h e r a a t h r a a i s u p f i c a l c a g w i t h a n i n f l a m m a t y m a g n b o u t 5 m m n d m e t J o E N K N A R T M D

R n l f f W F J A n A n a l y s f t h R l t f t h S u g c a l T r t m n t f 260 C n s c u t C e f C h n P p t c U l f t h D u o d n m A S g P a s 583

T h i s r e p o t b s d n 6 p t t s p e r t d p o n b y t h a t h s d p e t e t c h q o h h w s b d n t a n t m c a n d p h y o l o g c a l o n d e a t n t h t o m b i s f t y n d f c o c y i n a h g h r d e g r t h n t h m o r n r v a t a n d a l t h r m a d c l p r d c A l l f t h e p a t t t w e p r v a t s d t h y w r c n t t e d

r y s x m o n t h s t d e t r m i n e t h t h n p e s a t c o n d i t o I n n o n s t a c e d d n y p a t e n t f a l t r p o t T h e a t o n a l e o f t h o p a t e t e c h n q u e w a s

T r e m o v e t h m t c t i p r t o f t h e s t m a c h f o m t h e s t n d p i t f n t r c t l i t y n a m l y t h p v l c a t r u m a n d t h f u n d u p t t h i c u a g l r B y t h i s p r o c e d u r e t h d s t m l a t a g p o t i n o f t h e g a s t c m c s a i n t h e p y l r c a n t r u m a s w e l l s f r o m o n t h d t o o h l f f t h a c l s c e t n g m u c a f t h f n d u w a c i s e d T h r m o a l o f t h e m u c i t h p y l o i a t r u m t k e s a w y t h e g a s t r c h m o n e g t h c h i s a m a j r f a c t r i n t h s t i m u l t o f g a t s e c e t o

T o r e t b l f h t h n t m t y o f t h g t o i t t a l t r c t b y n a t c l g a s t o j e j n o t m v t h a l a g e s t o m a

3 T o n d c f e g a t o f t h r m i g g a t c e m e n t w i t h t h a l n e d u o d a l c r t o n b m a s o f t h s P l a y a t p e f a n a t o m a d p d c a m i m m e u t a l i a t o n f t h e g a t i c n t n b

4 T d i e r t h e f l f g a s t r c o t t s f o m t h u l b a i g p o r t n o f t h e d u d e u m i n t o t h e j u u m

T h c o r v t e t i n f l l e d b y t h e n t e c o l c g a s t r j u o t m y h s a l o w e r m m d t e m t l t y a n d f a l t s n y f t h s r g c a l p r c d u h c h m y b n c s r y a t h r u l t f p t o p e r a t c i m p l i c a t o s T h a t h a p p a e n t l y d t b l t h t i t i s n c s a r y t o p e r f r m d c a l t n e r e s e c t i o n o a l p a t t s w t h p t c l c f t h d u d n m b e c a s a l l b u t a l t l y m a l l p c e n t a g o f t h c a s e a e a t f a c t o r l y t r t d b y c e r v t v r s c t o n w i t h a l w r i m m d a t e m r t l t y

T h p e a t i v t e c h q u o n i s t e d o f m i d l i n e c o n t o l o c a t e t h e c m m n d u c t t t s p o t o f d a p p e a c e b h d t h e u p p e p a t l t h e e n d p o r t i o n o f t h d o d e n m T h e l f t g s t c e s e l a d t h g h t v a g u n e r v e r d v i d d t h n t h v e s l i n e i n t h e g a s t r h e p a t c a n d g t o l e l g a m n t s s w l l s t h e d u d n h p a t c n d d u d o c o l c l g m e n t s w e d d l y l a m p d a n d l g t e d t h s i l k T h g m e n t f t h e s t m a c h t o b m e d w a s n e x t c l a m p e d w i t h t w P y r c l m p s t h n t h e p y l o i t r u m p y l o c p h u c t e a n d p t o n f t h f i n d t t h s t o m c h w e r e m d T h t u m p o f t h d e n u m w s c l e d w i t h t l y s r o f i u t r d t h f i r s t t u w a s c i

o u s o n e w i t h O c h r m c a t g a t W a f e r t h e f i r s t u t u r w a s p l a e t h e r u s h d t s t g e t h r t h t h c l a m p w a s e m d T h e e c n d r f i u t u r s w e r e i n t r u p t e d H l s t e d s t o f f i c i l k h h i r t s t h e f i r s t c o n t n s s u t u l n e A a r u l e t h e y w e e t a t d m d i l l y n d c n t n d l a t e r l l B e c a e o f t h r l a t i e l y s m l l m n t f s t o m a c h e m d h o t l p n t c o l c g a t r j e j n t m y u l d b a d l y p f i r m e d w i t h o t t h c d o f a e t n t o s t m T h i s w a s s h t t h a t a f t s t r f t h e i n t n t t h n d f t h s t m c h t h d s t n b e t e t h l g a m n t f t t z a d t h b g n g f t h e g a t j u n l a a t o m i t t h l e s c u r a t a n l y t h n h b a d t h

The results showed that 204 patients (78 per cent) should be regarded as well, 30 patients (12 per cent) have been benefited and 8 per cent were not benefited. The immediate mortality was 2 per cent with no deaths occurring in the last 160 patients.

In summary gastric resection considered the best method available at present for the treatment of the complications of chronic peptic ulcer of the duodenum. It is not ideal but it is relatively better than lesser vagotomy and pyloroplasty.

This report was made in order to serve as a basis for further comparison and study. It has evolved from a search for a general procedure which combines in the highest degree both safety and efficiency.

SAMUEL FOG, LSON, M.D.

Holland r F R nak S C lp R and Ka i tz
R F A Synth tlc P edigested Alim nt f J
j nostomy F di g S g 3 945 7 754

Jj n stomy is u ed (1) s a p l l a t p r o c i u r e
f f d g p t n t s n w h o m o r a l f e e d i n g s a r e e t h r
d f f u l t r i m p o s s i b l e s u c h a p t e n t s w i t h i n o p e r
b l e o b t r u c t i o n o f t h e s o p h a g u s s t m a h c a d
b y a c u t e i n f l a m m a t o r m h i g n c i e s p a t t
t h i a n t n c a u d b y p e r n i c i o u s v o m i t u g
o f p r e g n a n c y () a s p l m a r y p r c d r e i n t h e
t r a i m t o f t e s e g s t d e n l d g a s t o
j y l u l c e t n c c m p e d b y m r k e d e d e n c e
o f a l k l o s i n d r e f c t o r y t o m e d i c a l t r a t m e n t (3)
a s a p h y s i c a l m e a s u r f r t h r e l f o f c t a i n
p s t p e t i v e c o m p l i c a t n f l l o g s g y f t h
s t m c h s u c h a s g a s t c d l t t n n d d d l
f s t l a r i s i n g f m s t c i n s u f f i c i e n c y — t h e j e j u
n s t m y b e g o o m p l e m e t r y (m a d c o n c i d n t a l l y
w t h t h e m a j r o p e t o) o r s u p p l m t a r y (m a d
u b s q u e n t l y t h e o p e r a t i o n) n d (4) a s a d f i
t p e c e d f p i m a r y g a s t d e n l l o c d
f i r m g i n a l l e c e n d a r y t g t o n t t m y —
u w h i c h w a s i n v o g u f a t i m b u t h a n c e
l o s t i s p o p u l a t y

Wh jejunostomy a first mpy d t as
accompanied by c t i n p t perat e mpy l
th los f i n t e l c o n t i s t h r g h n m p e t c e
f the j j n a l s t m t h p e r s t c e f j j l
f t u l f e s t w i t h w a l f t e n t t m v t b e d
t h e q n t e c c u c e f i t e s t n l b t c t d
t o t e c h a l m p e r f e c t i o n s o c a t d t h t h e W t z l
t y p e o f j e j n s t o m y T h e e f f i l u c h i c
t h a t e d b y m p o v e m e n t s i n t h e u g a l t e c h
n q i n t h r a o n f t h p p l i t v o f
j j n l m n a t n a s t h d i s t t c m
t i g m p s d r r h e d e n t t w h i c h f e
q e n t l y c o m p a n e d t I t h a s b n g e e l l y
c e p t d t h a t t h d i s e s g a s t r a n t c m
t m s m y b c a u s e d t h b y p h y s c a l f a t r s b y
t h e p f d t c t l y c h e m i c a l e s T h m l d f
t h e s y m p t o m s h a v e b e n c l y a s s c i a t d t h
p h y s c a l f c t r s l i k e t h m p o r y e n g e m e n t m f
t h m l l t t w i t h f o o d m a t i l T h e a r
a s l y p e t d b y c n t o f t h r a t e f d p d m i n
i t t n i t h e t h a n f i n e d p p p a t
m o t o r a c t a t e d p m p g d v i c T h e i m p o r t a n c e

of unemulsified fat in the splanchnic circulation is particularly marked. An excessively high osmotic pressure may also be a contributing factor to jejunal irritation since it will require considerable time for the small bowel to dilute the aliment sufficiently to prevent osmotic stimulation of the neuromuscular mechanism.

For jejunal feeding the aliment must be very easily digested or even partially digested. This is necessary because laryngeal and gastric digestion are completely inhibited and pancreatic and intestinal digestion are decreased. The latter is a consequence of the decreased stimulation of the corresponding glands and the reduced time of contact of these secretions with the aliment. Extensive digestion is important for a maximum absorption. Any factors which may irritate the bowel must be excluded from an enteric aliment. Its pH should be about 6.0. Its osmotic pressure must not be too much above isotonicity since the educts in this property, which normally results from dilution with the digestives, are not available after feeding a great in jejunal alimentation.

I am at the aforementioned drawbacks of just my feeding the author's suggestion a new formula for synthesis predicted almost. In contrast with previous formulas emphasis is laid upon the incorporation of digested proteins the marked reduction in the content the use of practically predigested carbohydrate free fibre sugars and the liberal supply of essential salts and vitamins. I decide on the efficacy of this nutrient mixture. I also decide on a decrease in body weight and absence of amputations specifically associated with its administration experimental animals and patients. Furthermost my. Furthermost it has been shown that the occasional occurrence of untoward symptoms like vomiting and distention can be eliminated by starting at a feeding rate of 6 cc per hour gradually increasing it to a maximum of 50 to 200 cc per hour about the fifth postoperative day the speed of increase and the upper limit being established for each patient individually.

The importance of sterilization of the aliment and the apparatus is discussed.

JO H K NARAYAN M D

M g n C N W unds of the C I n B t J S g
945 3 337

The study is an analysis of 128 wounds of the colon in only survivors. The right transverse and left cecocolic junction have been injured in equal frequency. The distribution of the wounds was most commonly caused by missiles entering from the back where the cecocolic junction was the most common site. Of 66 patients with penetrating wounds of the colon surviving for twenty-eight days or longer, one-third were operated upon fifteen to thirty days after the injury. One case ended after a time lag of more than eighteen hours and one left the colon intact after a preoperative delay of forty-four hours. This indicates that a

es srg ry may l d g d res lts mo e oft
than i g ne ally el d Am ng surv ors p
t d upon thn s v h urs ther wa a p p d
nce f those ith in ry t the tran erse c lo
he as am ng thos p rated pon in th sec nd
s h u per od th r s am rk d f l n th num
be l u f l l wing in ry t the segment
Th is d e pr b bly to the fequ cy f se er hem
hage l mth dee p n f ascul r mes nte y
m c l n a dome tum and fr m jury t thr
abdom l o gans Th b tter blo d upply of th
p smal l n nd the fr q c c f ther blom
nal injur i c a e th sk n j rest th e g
ments wh l the g ate rule c of th c tents of
the descen ling c lo nd th d f f u l t of m bl z
t n and exte o t n of th l tter nreas the
r k in w u l f th l f t colo In un mple c t d
o d penet t g the abd men sh k is n n
m s ith ter al hemo h g nd th und d
d n the first f hours f om hem rrh g d h ck
Th ind cat s the f nction of the res sc at on u s
first mot k the ou ded f t f p at n b v tr ns
f s o a d c nd t ma tan f l d and alt b l n e
d r g o lesc c

In r g a d to ope t tr atm nt of th i j red
c lo t r r a o f the damag d po t n hen
po s bl th s fest p oced Although it is
betie t br g the gut o t th ugh th k i nu
gent ca s w th a h r t l op th aper to cal at on
may be chi d by sut th iured c l n to th
par etal per to m a d l a n th abd mn l
o nd only pat l l s t r d

Wh n the coloz d t f the patie t uch th t th
sk of m b lization i t g eat los of th perfr
t n th t o layers f sut res a d c mplete
clu o f the gment by apr imal col st my the
n t b st m th d The colost m y m st h a g d
spu a d sh uld b establ sh d a n r th les n a
p ble The sut red a ea h uld b d nd th r
ghlv

Wh n th l ert h d f th j el c olo h be n
njur d a lequate p u e a d utu r d f f l t
that d ag nd p o m l c lo t m y lo c m y
ha c t suffice A g sly bru ed nd d tal z d
a o f b el h uld al o b t d a ape etrat i
E t per tone l perfor t n of the f i ed p o f
the col n must ot b o r l o k d d h uld b
treated by m b lization fo in pe t s tu g f
the p fo at on and clo ng f f th r a fr m th
p t neal ca it by tu f th b l to th pa
t th th p o f g d d a g Wh a
lag gm t f l l t b r ct d p m y
an t m un l d th t lo c t m
h ul t b b ght t d p nd ntl at th m t
c nt te H ft m lo f a h p
l s l j m d ght c l l t r l l t ns r
colo t m y h h l th pr l d f th
tran re l n ope t m nal c lo t m y m y
be ju t f l ble

Th c m p l c a t o f l l ng s pe t c p
cedur nd th cl r f th ol t m y r d
cu s d Jon L L p o r t M D

Ca e H W S gl l E pe l n c s with Ulcerati
Coliti f g Cl v f er 945 s 3

Th object f th pr t t n first t d c
c t n mpr s s and e o d t g l e som de
tail d tech c l ugg st as nd w r f the p f l l
h h m y te o nte ed in th treatm nt ful
t v c l t Th tho b s s b s stat me ts h
e pe nc s th g p t i s up h ch h r
f med p a to These g r n l d l u d ent
63 p r t n th 8 death n pe at mo tal
t f 95 p c nt

In the first y rs of th h th re e 15
meg y p at on th cut f l m nat g sta
f th d a th 8 d ath a oper t v m tal ty
f 53 per e t The f t l s l ed s th t th
t v p f c e h uld not ha ad rs n f th f l
t eam b cau f the d b l t t l e to m
h m rha Lat 5 il o t m s w red th
4 de th n ope at v m t l ty of 8 p e c t n
dd to th e r 46 ubt t l ol c tom th 5
d th n ope t e m tal ty of 8 p t g p
t al c l t me th d th an operat m r t l t
f r p e c t a d 8 l gm d t m e a d i com
bin d abd mn p i l ct w th f t l t
t c It m p t n t o k th m ed cal tr atm t
has p d nad q tew h n the p c h s ch d
th t g of r ers b l t Eal d ers o of th
f cal tram h n th d s f the i ty th t
w ll p c ed t i t a b l t y h l d be m p l d
m f q u ntl H e it s d f f l t d f f r
t at the t pe of th di n t p

The i d t o n f em g v g r i m p e d
p fo ton M s h m r h ge l l b e t c d
mo es s f lly by th phy c n th t ansu
a d nt p sm des th n by th uge p i cu
laly in the c t pha The ear t d t et
gr up of pat t who h uld m to sug a ly
() th ho ha e te p th l g l changes
a d () th t h m the d ea h s p o d f
a t v and remis n b t w m th tr d
d n d The l tte tpe fpat n c l l be pa d
p ol g d l l d l f c l n f l eost m
performed t th a l est ph f th d es po
d d o ert th t th d as s p g s e
nd c n t be m n g d m d cally Illost m y
m h more of isk th n ubot l c l to m y l 6
l s t m s th r r d ths m t l ty te f
8 p e c t A n tabl f ct th t m a y f th
p t nts follo l t m y nd bto l c l t m y
h m ed l l th ut p o t c t m y Th id l
pla ft m t f r a p t e t th a f r d a e d
le l g th t l n and t m first
a il t m nd th bto l c l e c t m y w th
h all f th p t n th t g ned s t f to lly
g h t a l th p r s t t b l l y d h g
f m th n m l f th t m

Th l t m ca b best ca d t thr gh
M B v th d f th l um ap
p m t l 6 hes f th l c cal l e Th
d tal d d d b ght t th o gh a stab
w d n th t r r b d m nal l hes be
lo th mbl d j t t the l f t f the m d l e

The rimald viled nli b ought out of the lo cr
ngle f the McBurney i c i n lgre t c e s
e c sed i s tun g the cut mes ntery t the peri
tome mon th undersu fac of the ant ror abd m
nal w ll in order t pre ent p lapse f th leal
toma The lum i l sutured t th peritone m
th No oooo pla n catgut n a fine tra matic
needle

The ec nd tag of the s rgicaly oced e f the
cur sulcer t e c l t i s btol c l c t om y The
means m val f th last 6 nch of th te m al
ileum f th c cum a lo f th a nd ng tran e e
and desce d c l as w ll a most of th sgm l
d n t app o im t ly 6 nches above the pe
ton al r f l c t on Thi i d e th gh a l f para
medi i c u f om th l l f the phoid c
til ge d n t d c l d g th j r v s mucous
f tula of the d t l d i d d ile m l d w n t 3
n hes bel th s p o n t Th m t d f f i c u l t p t f
s b t a l c l t m y m t l a t f th spl f l v
e d d i f the p l c l c l g m e t \ t
tempt h uld be m d to c l e the d s t a l d d d e n l
f th col n a n d p t b c k t th pe it l c a
ity b t the d t l l l l d t u t p r d u t
f th pel th t t p r t r u d s f r m 2 t 3 nches
alo th t e r i b d m n a l l Th l d
v l d s g m d sho l d b t e d t the p e r i t o e u m
and the t i r a b d m a l l l r d r t o p r n t
a p b l e t t i l t u c t i o n i v a l p f m l l
l e l p u s h n g t v t r o n g h t l w b c l e g
m t l i t h l t e r a l p e r t l l l
S M J F o c M D

McPh rs A G nd k n m n th J B Acute
Appe d c i t l a d e th Appendi M s f t f
S f 945 3 365

Th r t l a n a l 3 e s f a c u t a p p e d
c i t t d n S t Th m H o s p i t a l f m 937 t
104 n d m k s c m p i s o n th t i m i l a r
l e s f m t h m h p i t a l m a d o a f o r t y
v r p i d P e t c u l a r t t e n t d w n t a c u t
a p p e n d i c i t h m f m t Th l t t l f
c t t h t r m a p p e d x m i t h l t
t u a l f f q u n t l y t c o n f e l t h t h t m
p p l a b e s s B a p p d c i t s w t h m s
t h e a t h m n c l c a l c o d i n w h c h t r
i l d t u n t o t h e i g d s y m p t o m f c u t e a p
p n d e t m a s t h i g h t l c f f o s s a h c h i p a l
p a b l t h o t a e s t h e s i m f t h e s m e m a
c t s m p o b c o m e f l a b a c e s e w h l
t h r s c n t f n s f m d a p p d v l l e d o f f b y
f l m l a n d d m t s m n t m m t e r y a n d
c l f b o w l Th a u t h o r s b e l e t h a t t h p e s n
f a m n d e a t a n a t t m p t o n t h e p a t f t h e p e r
t n m t l c a l z e t h i n f e c t i o n a f t h i s t t m p t
a p p e r s t b e s c e e d g t h e c a s s t r a t d e r
a t l y Th l n c a l f i d g s t h t n t h
l g t h l t h s t r y c e d t h m a n a g m n t E a l y
c a s e r t t d b y i m m d t p e r a t n n d v h
t h v d e n c e g g s t g s p d f i f c t n o
f k d f f p e r i o n a t a t h t m c a d m n o
p e a t i a l d T h s c e r v t t t m e t

n t t l e c n f u s e l y t h t h e O c h s n r m e t h o d o f
t r e a t m e n t v h i c h i s a p p l i d t c a s e s w i t h g e n e r a l p
i t t s

P a t i e n t s v i t h a m s s a r p u t t o b e d i n l o w F o l
e s p o s i t i o n s s a t i v e e n e m a s o r a p e r i e n t s a r e
a l l o d f l d i n s m a l l a m u n t s o n l y a r g i v e n b y
m o u t h a n d t h e h l f h u r l p u l e r a t i s c h t e l
l d c a t i o n s f a b a n l o n t g c o n s r v a t e t r e a t m e n t
a r e a g p u l e p r s i t e n t l y e l v a t e d p u l e
r t e n c r e g s g m a n d s y m p t o m s s u g g e t t a
s p e d f n f e t i n b e c e f m a t i o n (a t a l a t e
t a g) a n l a n l y a f a l u r t o r s l y
C o n s e r v a t t r e a t m n t n t a d e d f o r c h i l d e n
t h a g l o r n p e g n a c y l e s a r y f i m a n d l o c a l
i z e d m s s p e c t o n a d m n i o n a n d t h i s u c o m
m n i n t h e t y p e s I n t e r v a l a p p e n d e m t h
m o n t h a f t e r l t n f t h m a s r e c o m m e n d e d
f r t h e c a s e h i c h h a e r p n d e d t o c o n s e r v a
t i e t m t n l s s a g t h g e n e r a l c o n d t n o f
t h e p a t i e n t c n t n d c a t i o

T h e 5 t c a s f m p l e a c u t p p e n d c i t s
90 i t h d i f f u e p r i t n i t i s a n d 9 t h a m s T h
m o r t a l t y r a t n s m p l a p p e n d c i t s a s 17 p e r
c e n t n c o t s t t 56 p r c e t i n c a s e s i t h d i f f e
p e r i t n i t i s O n l y r p a t e t n v h m a m a s h d b e n
f e l t b f e p e r a t i d i e d h c h g a v e a f i g u r f o 8
p e r c e n t N d e a t h s f l l o d i n t r a l a p p e n d m y
C o n s r v a t t m e t a a b a n d o n e d i n 3 t c a s e
T h e t m e p e n t i n t h s p t a l a g d t e l y n d
i x t n t h l a v n s m p l e a p p n d c t t h y a n d t h r e e
t e t h s d a y s g n e a l p e r t i s a n d t h t y t w n d
e t t h d y s f o t h m s c a r t r n i n g f o r
t l p p e n d e t m y I t s s g f i c a n t t h a t a l t h u g h
a l n g r h p t l t a v q u i r d t h m a s c a s
n l y i t h e e p a t i l l a n d t h s d e t h i l l o e d
p e t n f a p p d c a l a b s c e s T h l e s t m o r t
t l i v y o c c u l t h m a s c a s d e s i t t h e f c t t h a t
t h a r a g h t o r y l o n g f a c t o r h c h w a s
b l d t o i s t h m o r t a l t y T h e p c n t a g o f
f t l c m p l e t n a l s m a l l s t i n t h m s
c a T h m t l t y a t e f o r t h e c n t e s i c s f 730
c a s e s a m u t d t 91 r c e t

J o v L L t o s t M D

A y k T B n d F r i F M Appendi l t t Th
P o s i b l E f f e c t f S f f a m i d e n a M o t l i t y
f S g 945 7

T h e a u t h r s r p o t o f t y r s f e x p e r i e n c i t h
a t e p p e d i t a m n c p a l i n s t i t u t n r
t l S h u n l e l d f i f t y o p a t e n t v e
p e t e n l n g t h e f t y e a r p n o d n d
t h u t t h e o t f t h e l f o m l e s w h n
p e l a n h a d c r d D g t h e l e q u t
f y e a r p e o d 500 p a t e n t s w e p e t e d p o
a n d l f m l e a d m n s t e d t o p c a l l y a t t h e
t m e f p e a t i o n f p e f o r a t i o n e t d F o l l o w i n g
t h p e r a t n s l i a t h i a l w a s g v n o a l l y n n r l y
l l f u c l c a s e s T h m t a l i t y a t e w l o w e r i n t h
l t t g r p
F t h e c l c a l n d x p r m e n t l s t d s e n e c
a r y m d e r t o d e t m i n t h e v a l e f t h e s e
o b e r t J G r e M D

Holland C A Multipl Ca inomas J Am M
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Multipl prim ry malign nt growths sh uld now
rot b ons d r p th logical cu os tes and r
ma kably a b cau e th ir nc denc va es from
334 t 433 p c nt Th ca ported p esent d a
ca c n ma of the b ea t in A gu t 933 and a car
c m of the esophagus in J n 939 t hich time
th pat nt l oh da mall basal c lica c n ma fth
l ft h k ln J ne 942 an n n l r car nom of
th h p t c f l xure was fo nd nd atp ent t nty
ght m th afte th r m al of th f u th ca
nom th p t n t i th o th phys clor r tg n
ev d nc fa y m l g a t l e a

S L E J FOGG SO M D

LIVER GALL BLADDER PANCREAS AND SPLEEN

A l y M P nd C m f t M W O c l i n of
th H p t i V l s A R v w f 20 Cases A h
f t M 94 7 7

Oc lu n f th h p t c v a ac d ntal
f nd ng n x f the 2 c s p t d by the authors
n therem n ng 4 it play d majo role n th l l e s
The ccl i n n l l e a d e t o th m b o s O
cl s ion of the h p a t c i n may b prim r r
secondary to n l a m m a t v c r h t i c o r n o p l s t c
d i e a s e f t h l t t h o m b o s of the n i g h b o
m g v e n c a a t d a s e s n h c h t h o m b o s c c u r s
f e q n t l c h p o l y c y t h m a n a and perhaps
the s l w i n g f the c i r c l a t i o n d e b l i t a n g d e a e
While i t s m e r l a n c d e n t a l o b r i a t o n t
a u t p s y i t s h o l d b p e t d w h e n a n a c t e p i
f l e p i s d i t h s h c c u r s d u n g a n o t h r i e
c h r n c o r s f h e t c d e a s

In cases of acute c l s n f th h p t c e n s a
w e l l a i n a c u t e t r m n a l p s o d e s f the h o n f m
of the d e s t h r a p d t y f n e i n t h e o f
the l e r t h r i t h e d n o f p f n d d s t u r
b n e u s of h e p a t c u n c t i o n a n d f p o a l b s t r u c t o n
(h c h c u l d b c a u s e d o n l y b y s m r p d l y d e v e l
o p i n g p o s s u c h a s t h m b o s) m y w l l s u g g t
the c o r r e t d a g o

Acute c l s i f th h p a t i c n h a b e n c o n
f u e d w t h a c u t e p n e r a t b t o m a l s e r u m a m y
l e s f i n d i n g s l n g w t h a p d l y n l r g l e r a n d
t h r a p d d e v l p m e t o f p r t l o b t r u c t i o n r u l o t
the p a c r e t c l e s o n E A R O L T I M E R M D

Aspray M Calcified H mang m s f th L J
Am J R t g 1945 53 446

Th auth r r p r t a c f c a l c i f d h e m n g
o m a s f the l e n w h h n r e t g e n e m n a t n
of the a b d m x t e r u m b d c a l c i f d
s h a d o w w d m n t i d n t h r g n o f the g a l l
b l d d r W i t h i n t h r u m b d a s t r a k s o f
c a l c i f i c a t i o n s e m e d t o a d t u f o m t h c e n t r
T h i m p e s o n w a t h a t o f a b n g e p l t
v o l e m n t o f t h l v e r p b l v h m a n g m A u
t p s y f d n g s l a t r e f m d t h d g u s
E A R O L T I M E R M D

Smith B C Acut Ch l e c y t i t l The S r g e a l
T r a t m e n t f 332 C a s s S g C l \ A m e r i c
945 S 85

The autho has r e e d 33 c a s e s f c u t e
c h l c y t i t i The r a t f f e m a l e s t o m a l e s t
Ch l c y s t o m y w s p e r f m e d o n 3 p a
t e s w a t h a m o t a l t y r t e o f 35 p e r n t a n d
c h l e c y t s t m y w a p e f r m d o n 3 p a t e n t s
i t h m o r t a l i t y a t o f s 6 p e r c e n t T o h d e d
a d t h r t y n n e p t e t (70 p e r e t) e o b
r v d f a p e r o d r a n g n g f r m n d y t f i
w e e k s a f t e r a d m s o n b e f o o p e r a t n 4 f t h s
d e d w h c h g a v e a 10 p e r c t m t l i t y r t e
N i n e t y t o c a e s (30 p e r c n t) w e c o p e a t d u p n
o the d a y o f a d m i n w i t h m o t a l i t y a t f 54
p e r c e n t C u l t u r e s w e r t a k e n 28 c a s p e
c e n t w r e r e p r t d s p e s n t n g g r t h t h
b a c i l l u s c l a s f o n l y 7 t m e s t h e s t p c c c
v d a n s 23 t i m e s t h e b a c i l l u s e l c h t m e t h e
h e m o l y t i c t r e p t o c o c c 5 t i m e t h e t a p h y l c c u s
a u s 7 t i m e s t h p e m o c c u s 3 t m e s t h e
h m l y t c b a c i l l u b l 8 t i m e s a l t h t p h d
b a c i l l 7 t m e s

The e r e d a d a t h s a m t l i t y t f 7 p e r
c n t O e d a t h o c c u r e d i t h u t p t i n T n t y
d a t h c c u e d n p a t i n t s o f f i t y f f g
T w t y p e c e t f i t h p t e n t h a d e t h g a n g
o p e f o a t n o p e f t i o n w t h a b s c e S e v e n
p t n t s d d f a c u t p u l m n y c m p l c a t i n s
n d 5 w t h r d a c d w i t h n a l m p l c a t n s
O e p t n t d i d o f a s e p s d u e (a c d g t t h
u t h r) n a n f c t o n f i t h e o p e r a t i c f i l d h h
h d b e n c a u d b y l a m p t h t a d j p p d o f f t h
c u t c y t c d e t T w o p t e n t s d e d f p l m y
m b l a n d p a t e n t i e d t h s c o m p l e a t n
O n e d d o f a p l x y d p t n t s s c u m b d t
h y p e p y r

F e e a y d p u l e l u o y t s a t n d e m n
t h r i g h t p p q a d t a d m u c l e p m
d a t n s f o u c h t t m e n t a s i t t t h
t h e p a t e n t o d t n O n e p t n t m v h t
b c n t n t w t h h l v t s t m y a s l f s a g m
S o n d y h l c y t o m y h o l d b e
l n a s s o o n a t h p a t e t c d i o n p m t
A d a c d d e s l h e n t h e b o d y m a y c e s
s t t a c p t n c f c h o l i s t o t m s t h e o l y
s g a l t h p y p b l

I f t h l i m a c o r s o f t h p t n t d o e t m
p o n t e l e h u g e r y r m o r r g d m d c a l
i g l s n d a t d F a l t m p n t n t y
f h s c a l l f u g a l n t r e n t o I m p o e
m t n d e m d a l m n g m e n t p e m t t h d
l y o f s g v E A R O L T I M E R M D

McGuig n W J Acut Ch l c y s t i t i s A C o m p r a
t l S t u d y o f t h M o t l y R a t a f t r i m m e d i
a t e n d D l a y d O p e r a t i n A m J S g 945
68 9

O e h n d r d a d t e t y t h p t n t s t h a c u t
c h o l y s t i t h e m e t o p e r a t i o n t h e H a z l t
S t t H p t l f H z i t n P n s y l a n d g t h
p a t d c a d e T h e w e 98 f e m l e s d 5 m l e s

th rages aried fom t nty on to se nty years
the a e age ag bei g forty s x and on h lf y ars
All cei ed es ent allv th ame preope ati e t eat
m nt morph ne hypoderm cally n c cap t the
abdomen a d parenteral inf n of gl coe so
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The postoperati e manag me t fall w s also m
ilar m phne for p in nd gl cos s luti ns to
ma ntain th wate balance and to supply sug to
the l r

To th pu pos of c mpa at ve t dy th is m t al
was di d d into groups cc dng t the l ngt h
f t m el ps g b tw e th on et f th sympt ms
and th oper t n gr up I mpr ing those c m g
to ope t n vith f rty eight h rs aft r the s t
f th t t k gro p II those com g t op rati n
b t en fo t v ght an l e ty t o hours gr up
III b tw nse e ty t o and n et y s hours g p
IV b tw n n nety and one hundred t ent y
hours g o p V b t een hu dred twenty h urs
and seven d s and group VI between ght and ten
days These g ps c mpr ed respect ily 17
20 4 3 and 17 p tie ts Se nty t o ho rs was
arbt ily hosen a the di idi g poi t b t n the
immed ate pe at n (with in se ent y tw h urs)
an l the del yed p d (aft r s v nty two h rs)

Under the e co d to the p at mortality of
th first t o groups that up t e e t w hours
was 36 p cent nd 118 p cent n r pect l r
an av rag p rcentage f 27 for th rem g
gr ps th r spect v pe ce tag e 5 42 and
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g p Th t t l t to fo the tie ees f
ca as 56 p pe ce t ate h ch comp res f o
ally th ther t t ties n th l t at

B ca e f th educt n m tal t t s no th
pol y f the H zelton State Hosp t l t eat ac t
ch l cyst t e pectantly a d hen the del v es l t
in p mement of th c dition of the p t e t
ch l cystect my pr f rred to h l e v s t tomy and
s em t be better b rne than th less r al cal oper
ati n v h n t i perfo m d imm d at ly H w v r
th policy a f le ble on f th p ges n f
symptoms d signs th t s f th u s d f
p ges on f i f c t as sh n by inc g f
the l coct count the puls ate d ce
e f the t dera togeth w th m cle p m
th pect t r t m t i n t r u p t d the op
t n pr ferably ch l cyst t m v pef m d
Ch l cystost my now us d l i ged nd id
l whose e d t n s uch th t m e e t i
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f ag a d debil ty al

J t W B M D

Sch k J R d Col m F C Ch l lithi si
G t i l e y 945 4 344

ch k a d C l m p l ce n d th h
t r s f h t f le p t nt g d th t h
s f f g r m l l t t A ch l c t t m
p a f m d d th g l l l d d f nd t
t n 363 9 t es Th unt a m d b v n p e

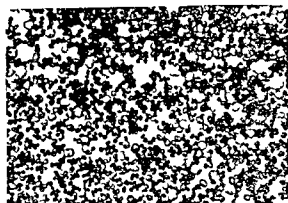


Fig Photograph f m l l p o t f th t f d
th g l l b l d d N t th t l l f th m l l t
f c t t e d (X)

son a t d t as stant luring h e ye t the
Lous ana St te U v ty Sch l f M l c n Tle
to e e d v d d into m all g u y l o l v n
g up was co t d t a t m e t a l

B N J A M I N G O M A N M D

Catt H R B P ncre tod od n I R ecti n v
E g l d J M 945 3 5

E ghtee p t i e n t e u b m t t e d to j a n to
d d n a l r e c t n a t the L a h y C l c l n a l l
t i n a l p a t n t s h a d a f i t s t a g e o f e r t i n a d a
s e c o n d o p e r a t i o n w p l n n e l O n p a t e t e f u l
a s e c n d p r o c u d a n t h r c e i d e r d t o
p o a r s h t w h t d t n l t l l a n o t l e n t
o p e t e d p o n f u t h e r b e c u s e h p e s t e d v s c l
r e s e m b l i n g h e m a n g o m a s t h g h u t h p a t i v
f i e l d T p a t n t s e f u d n o p b l e b c a
f m t a s t a e s t p t i e n t h a d l e m e n t f t h
p m e e n t e i c v s l d r h l l e n g
t u m o t h a t c o u l d b e m d l o c a l l y f r m t h
a m p u l l a I n a d d t n 3 p a t n t s e e e x p l l t
t h c n d t g e n d a f t r t h p c r e a s s f r l n o
t m f d a n d t h p e r t i o n s d c n t u d
t h e c 3 m n l 5 o m n w h d r e n t h
c m p l e t e d o f t d l v 2 f t h e m e
t t e n f o t a d f r t f i e f g

The p s n t g y m p m t e a e a s j u n l c
d n 2 e m i a o f e p l a e d o r g O h
p t i n t s d d n o t h a v a i g h t l O e i a t t h
r m a n d l l f t o v e a 5 f o r g h t n m t h
4 f r a y a d 3 a c i n g l c d t n h a v g t
p e a t d p o n t h n t h e j a t a f i v p a t e t
h d a n t a g p c t o l d e n a l e c t i o n i t h
l t h t h e t g i o c d r v e m p l o y d i n 3
t n t s t h d a t h a m r t l t y t e f l
c n t T o p a t e n t s h d e l i c q t t l a g
t h e h p t l i g h t n l t n m t h f l l i g p
t i o n e s p e t i v l

Th u t h b r s l d e s c r i b e s h p t i t c h
q Th p r t l a r p o n t s d a l t o n
f t h p a a d d d n m s d a l t d t
f t h e e p e b l b e f o t h s t m a c h l l l

and the authors meth d of t a plant g th pan
eatic duct in th jej num All an stamo es ar
ntical c E O L rrrr MD

MISCELLANEOUS

Dixon J L M t n G nd O h n A T at
m nt of Abdomin l Inj ri Re le of 89
Pers n i C s A J S g 945 63 43

In fo m r m ny bdom n l n j r con
der d hopes but at pr t mor ff ent
m th d f tr n portati n and the cr ati n of spe
cal urgic l unt fo th ca f b d m n l n j
ha mad th utl ok m ef all

If hock r i pe d g h o k i j e n t t t t
ment h uld be the p m y n d at n Fr m
to / g f m ph i g n ub t ne l o
gr i j j ct d into th e n In th abe c of
head nd h t njure the fo t f th bed el at d
2 n h a d s p r e n t g l u s in no mal al n
lut n i g n immediately f llo d by pl ma
r blod Aden l c r t cal h mon (75- oo d g
n ts) g en i tr v n u l y ha be comm d d
by s ne but t val has beend p ted Exc sve
v a m i g of the pate t d r t mental b t chill g
must b p nt d th cfr pat t a e o eed
v th blanket O y g n sh uld b e n by m ns of
a na al cath ter or th Bo thby m sh to p t
ano ia The pul e and bl d p es ure h uld b re
c rded at l t r y f i e m ut s

Latent can be d d d into the t p () pa
tents who r sp d ell t shock t e m nt d
sho tabilizati n f th bl od pres ure nd pul
r te f r f m o e to t h urs—these m v b
e at d upo i f e pl at on d cat d (2) p t e t
re pond ng t t atment of sho k nly fo a h rt
p rod of t m nd th n r lap ing—these ggest the
pr enc of intra bd m n al h m h g d sh ld
b op ated up at onc in od t c nt l bl d
ng f r th r blo d tran fu on w ll b neces ary
(3) pat nt ho d o tr po d t ad quate sho k
th r py but c t u in p f nd ll f r the s a c
hopele s ca es nd surg ry m v nly hasten d ath
how r h h o e surg v m y o ca lly p
l f e av ng

Ad s D g is Th m unt f bl d lo
best timated by th rum p tend t m t on
nd by the fl l g d op m thod of B r bou and
Ham l t n t g the th h mato r t ead g Th
leu ocyte c unt f l f l l u n l y s may in
d cate blad j r d x r y e am at n with
s dum odide i t l l to c tosc py n ay b
n c s y A e t l m t e h l d b d e t
l term e the p s n of bl d i th t m
R ntg n gams ar f d gn t c let f r
m a f e g in p r fo t ng w u d f th bd me
th c t po ito f th p t n f the at p
t ior oentg nog am t d bl b t n the p e n e
f hock th nte opo t r o t g n g m th the
pat nt n left late l d c b t p f i bl Ab
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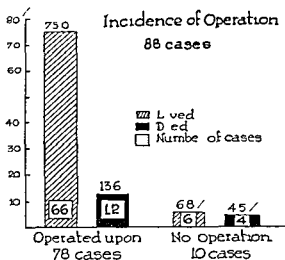
f r t pe lly h n th inju y l e s n t l
th t mach l n l r t neal p i t than
8 gaug sp l n edl m v v i l l llood o f call
ontam nat d p r to f l f d nd th nly the
d agn f a r p t u ed cu Ho v negati c
results i e r a l n t f e l u d post f i g
at anothe po t

P t i s t q i g o p e at i Thos
hom hock i c ntr l l d a d th n j v conf d
to the l ub ta c with p b l t y f n j r y
to the gall bl dde r xtr h p t i b l du ts Bl d
ng f m the lie s all r p nd to con rvat
tr tm nt a l p a k ng o sutu n of the l is
nly l y n e ary Th e th n pen t
g und c n t n d to th abd m n al p a d
a ated th con d r bl blu tr m j 3 Thos
th pen t t i g u d s m d th m l l h p
trument u h a n c e p c k o th mult pl
br d h t d Sin mali b el p r f to
al th t l k g e o l c r f u l b r vat n
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o bl d ubt n pl ato y ope at o sh uld b
t d t

P t i s d f i l y r q g p at i Thos n
hom sh k o t nue f r f r m t n d n
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transfu ns n the ca s nt a abd m al h m
rhag s s all p t and must be t l l d a d
blo d t r n i n m st be o t u d Those
ith bd m al llwo nds ith p t i th
t n gut or om ntum 3 Th th definit e
d c f p e f at i n f a h l l w u ugg t d
by m t ng f blo d bl od v tool o s g n s of
p e r t t 4 Th th a g abd m l
p i and r g i t 5 Th with y d e l
a nde th daph gm 6 Th s tha i c a
ng pul ate th p n c f que t n ble
d nce f t abd m n al j r v 7 Th s ith
k d e y n j hen the s d c f e v e
r r p r n t n l h m h g e m fest d by b l ng
f the fl k pa hem t nd ac re ing h ck
8 Th th nju v t th bl d d r d t nd by
h m t r c y s t g phy c v os py

F pr ane thet m d cat m r phin (/ t t
gr) ith p lam (/ oot 50 g) p e f r
n e t t p i e m m nded f h r th s d
ut f t t u nt t n ho l d th b g i f
t o d h d b ng n f e i u l a b o s t r d o r i
e a y l n th p s n f s re nt m nat n
ply l n t ga b c l l n t t r c m m d e d
Th th t h l d l l q t p t h g f
g t n m p l t e l d m al e l t n d
ap d t n f i t g v E a h l
ene nd to f l l l b th nd v g n l l p
to go p t l e l v g n n e t to c y l
p p a a d v g l l o f m 6 t 7 p c t
gen o nt t n S p n a l a e s t h e h l d b
u d l y h the s d f f h c k r m
pe d g h k N t de n t r o m m nded
b ca t does nt l l s f f i t genat o

la t n l t thal is n t an an thetic f ch
 becau e f fr que t laryng al p n n
 a d ne mplet laxatio nd d f fult cont ol
 shock When it s used oxygen sho ld b g en
 s multa sly In 7 500 cases of pentothal a s
 th s a in the A m v ersea th d ath rat at
 trib tabl t pent th l a ported to be v tim
 higher th that fr m ll oth an sth t ag nt
 comb n d A local an sth tic ma be u ed for m ll
 n pe t at ng wou d Th nd should l
 scrubbed th s ap and ster fo te m tes Th
 l ng tud nal p med n nc n all s better x
 pl at n and m y be e tended t an L o T
 h p Th bl d filled abdom n l cav ty sho ll be
 emptied by ct euf s n f th blood ec
 m mended only if no othe blood pl mai a ail
 abl l rst a s arch f r bleed ng points sh uld be
 mad fh pl at n sh ld b mad cc d g
 t the re f th t e nal wounds Injur d vess l
 m y be found in the root of th mesent y f me
 tum and h morrhag may b st pped by dg tal
 pressur and s bs q nt lgt n Befo e th ab
 d m n cl sed c reful search sho ld b m d to
 d t m he the blood s pply t the bo els
 was ot i ter f r d th b y lgt n when th s has
 b the ca adeq t ection vill ha t be
 m de P forat n of the pancr as m y eq ire
 m tr ss t e r a mac t d pl of k l tal
 m cl pack g La r ds onl f bl d g
 p fus ly ed t eam nt f m lar nat Bleed
 g fr m the pl n us lly r qu s pl ect m y
 Th s f ll ed by sy t m at c plo to f p
 f at n b gnn ng n the m d dle of the tran rse
 c lon a d e tend g to th s des to th c cum d
 ctum The sm ll t t best h ked f m
 th Tr t l gam t d n l th n th tomach
 a d d u m clud ng their p st su fa s
 m t b ual z d Whe r p t ng f the
 b el p e f rat n p r s impos s ble e ect n m y
 b nec s y h ever n th p e enc f h k a
 do ble ba ell d ter t m y col t m y f th
 M k l e z type is p e f ble
 P f at g bl d d r juries sho ld b t e d by
 cy to t m y d cl u f th p r f rat fr m th
 ins de f th bladder a d ins t on f u r ap b
 th t th pa of Retz us m y al be d a d
 Local impla t t n f l l m id ca s c
 i d t n and u doubt dlv t fe s w th
 v and h l g the el yst m c adm trat n i
 p fer d No traper to cal d ain el b t a
 d in pl ced thr gh th und d n t the
 pe it m to p entruptu fanat nt the
 pert l ca ty C tton is p e f d for d
 l u e but w may b us d f ap d lo th
 th ugh d th ugh ut es
 Iost pe t ca clud m rph (g)
 ery f r h rs W ge ten uen th th
 L in o Mill Abb t t b a he t t n t th
 b l m n th T ndel b rg post n t l th pa
 t t k f m thes th F l r po
 t a ch g f th p t po t h
 c rag m nt f deep b ath g and gh ng



Fg G phic p t u f d f l p t
 my d m t l ty th se (C tesy f th
 Am c J l f S g y)

ooo c. of 5 per cent glucose and 1000 c c f
 gl co e in sal solution th in outp t sho ld
 b atlea t 500 c c bl d tran fus and plasm
 or am ac d sho ld b g accord g t th
 findi gs Sod m ulfad a e (2 gm ntrav n u ly)
 sho ld be g en th times daly to ach a blood
 le l ff m 8 t omgm pe t V t m i C (300
 mgm) itam B (60m m) In c (5 mgm)
 gve daly e r c m m end O y gen s g n t
 p ev nt o em a a d to a d b orpt n of n t gen
 f m th gast te tnal ct Suct n i c n t u d
 unt l the il u ub id s d act e r stal i can be
 h a d th the steth c p e posit pylo c bal
 ce (Ba tlett) f und and g sp ed by ectum
 then f d g is um d g adual ta t g ith fat
 fre b th and plain t

P t p t c p l t At l ctas s dev l ps
 ap d l th tw ty f u hours tr atment con
 s t i cou ag g pecto at n a d asp t n
 th th l th t f eces ry by b n
 cho c py

Tr tm t f th mb h le b t includes laly
 l mba sym p a t h et block cl ation of the leg and
 th u f elast c land ges nd he t Ligation f the
 f m l e n r s d by r e c v th l
 purat th mb ph l E tis py ph l bit H
 m m d t f m al l g t n h ld b th
 l v y ph l both mb s s c n f m d by h le
 b g a hy l e r t n t m y f q e t l y l caliz n
 th l d c s which m y equ e c e n and d a i
 g th o gh th ant r tal all v ub dia
 ph agmat c f ction u u ly eq ir co erv ty
 the apy but if a l c e s s d cl p dra g sh ul l
 b don by th tr per t n l app ch ith es c
 t of the t el f th r ght rib

Th f u patient h died w thout perat
 e pract call m ibu d at th t m f l m

GYNECOLOGY

UTERUS

Ab banel A R Th Spa molytic Acti n of M g
n lum ions on th T tanically Contracting
H man Gra id Uterus *Am J Obst* 945 49 473

Th m g e s m i n has b n graphically d m n
t ted t rt an imm di te sp smolytic effect
upon th t t nally c ntractng human gra d
uteru Mag esium abol h d t ta i d ced by
the f llo ing oxytotic ag nt posterior lobe p tu
tary h rmon — i h l ext act (p t it) p fied
y t c c fract (p t cin) p nified opres or
fraction (pitressin) quinn erg n v n and me
therg n (a synth c g n v n l k s b stance)
Sat sfactory r s lts we e b t i e d b the intra e
n s admini t tio of eith r a c c f a p e c nt
s luti n of m gnes m sulfate c c of a 20 per
ce t olution f magnes m gl co ate Magnes um
probably acts d cctlv n the mv m t m sl i g
the rad f the c ntr ction a e

Ind d ute ine t tany m y be p e nt d by the
pr phylactic intrav s dmin strat n f m g e
s i m s lts from th e to fiv m nut s fte admi n
stration of th y t c c ag t

Posterior h e pitu rary h mo e sh ld n t be
g e in a dose e c dng 1 U that s o i c c or
5 m i m s nd sho ld be meas d t in a tub r
cul y t nge

M g n sium ion h no d mo t abl f f ct pon
the p t t n of ut ine m t lty in the first st ge of
labor It does h wever ert a d f t analg c
effect as f as the p t n t is conc ned

C l c um ion has l ttle no value a pasm lytic
g t upon ind ced ute i e tetany
Clin cal use of th anti p mod c prope t es of the
m gnesium ion h accomplished the f l l i g

A Immediate r l a t n of oxyt c c und c d
ut r e t t a y

D ing ind ction f l b m nag m nt
of second d g e e ut in i c t i a

2 In the third st g f lab for a sepa ted
r carce ated pl centa

B Pre ented ut e t t v f l l wing the u e of
oxyt cics

C R lief of ft pra

D Alle nation of e ent l sp mod c dysmenor
rhea

E Rel x t n f B nd l s ing

F Rela tio of tet nic lly c t act d ut ru in
brupt pl c tae

EDWA RD L. COR ELL, M D

C hman B Z Hy t rectomy with Preservati n f
Ovari n Tl u in th Treatment of End m
triosis *Am J Obst* 945 49 484

Th s r y incl d s 27 ca es f h y t ctomy
The largest numbe f ca es (79 p c nt) cu ed
i pat t b t cent nty fi nd fo tly f y a

of ag Of 26 patients ho were less th n t entv
fi e y e s f ag o had chocolate cysts of the ovary
and 6 had endometriomas n old abdominal scars
The others h d endometr al implants on the pe ito
um or sacrouterine ligaments There were pa
tients bet een fifty nd s i ty years of ag 3 of them
we re st ll m nstruat ng and these had adenomyosis
or adenomyom s of the uterus The main ng 7
we re past th menopause and the op rations we
done fo other conditions (ovarian cysts [malignant
and b n gn] pr laps s ute and i g n ulosa cell
t m o f the ovary) and local zed adenomy sis of
the uterus i as fo d

One hundred and ninety four patients ere mar
ried and 137 or 70 6 per cent gave a h st ry f
p g cv O e hundred and twenty eight or 66
per cent had ch ld en and the 9 others had had m
carriages Se entv seven we e s i gle

Eighty n n had fib omyomas and 19 had adeno
myomas r n incidence of 39 8 pe cent of my m s
Chocolate cysts we e prese t in 73 cases

Co ervat e operations (remo al of one o ry
and/ esection f the ovaries thout hyst r y
c t my) were d ne in 16 8 per cent of the cases in the
younger g oups when the d i case was not advanced

R m l of all o arian tssue ith r without
hyste ctomy w s done in 39 cases and d ium s
used in 5 an inc d nce of 23 4 p cent of ov an
ablat n

In the f ll w up s e s there w e 17 cases in
which at ope tion d f nite nod l s w r found in
the wall of the recto gm d b d ng the bow l to
the po terior s f ce of the cervi a d uterus

Hysterect my with co ervat n of s me ova n
tssue was done in 85 cases o 54 8 per cent a d in
9 cases the ut rus lone w s rem ed

In y ung women the surgical t eatm nt of r c g
nized e dom t i o s s should be po tponed as lo g as
possible and the decision f perat n sh ld b de
t mined by the se erity of the sym pt m and the
tent of the d sease

In endometriosis unrecognized before lap ot
omy c nservati e s gical measure sh uld be use l
when there is pos bly f f t u e p gnancy and
when the symptoms re ere the tent and loca
tion f the lesions e al o determining f ctors

T tal ablation of the o ares in the su g cal t eat
ment f endometriosis i w men i the m nstru l l e
i not eces ry for the r lief of th condition and
the p ecipitate men pau i not desired

R moval of the terus w th p eservat n f n
i vol ed r ant u e i eff ct e and prev nts a
p e c p tate m nopa se EDWA D L. COR E L M D

M ig J Y The W rtheim Operation f r C rci no
m f the Cervix *Am J Obst* 945 49 54

Th e w s no postope ti e m rtality n th s
gro p f 65 pat nts who were s bje t d t the

W rth m perat n f ca ci om of the
 Thi result is fmay imp tance f ith the v
 ll t ults btained ith ad m and ray
 t atm t n e uld da e rrt g ry if the
 m tal ty h gh The e fig es p e th t se
 g v can be don s fly nd ther f it ppro
 p t th t u gical t m t ho l d b l ated
 by t i al ges of ca The fa h gh
 m t lty h l d n l ger be a l t e t t th
 g cal t eatm t f l c t d c e f r cal can
 Of 6 pat ts 5 (7 p c t) k o t b
 d d d 3 f th had p t l mph n d s
 Of th 53 pat nts h d d n th p trv d s
 ly de da r v l at 1963 per t Of
 th tot l f 65 p t ent 5 e d h e r ent
 d seas nd w l st whic h g es t al p ob
 able l f 3 p r nt a d c cted al
 figure f 87 p cent

It ot p ble t comp e th e fig th
 k o fi ve r s lts foll i gh e of d m
 but f th goup f p t ts ar l e f e y ars
 o l s f f y e le q f thr ye o
 l s 18 f t v ars o le nd f e y a
 less Undoubt dly m lld b t judg g f m
 th r l t a d e ng the pat t m follo up
 l ies the auth pr d ts th t the l t mat lts
 f th s f e y a ries w ll be mo s t fact ry than
 those n m l gr p t a d w th rad m
 dum plus y th py

No co r lat n co l d b m d of the 8 p t nts
 h d d l t e l ng th d e a
 th e t n t f th d s a g d f the can The
 d ad o d ng e too f w to ttempt y statist cal
 den Th ce who d d had p t lymph de
 hich p h p a s g f i c a n t f c t
 Surg l emoval f the ca ly can a s f as
 dat e tment f t

Th n mbe f fist l f the uret ag l ty
 tool ge but v th b tte und rst d g f th
 bl od s pply f e r s h cal m ties ar p t d
 Lymph od n ol m t i r ble by g
 ev d nced by the p ts f B ney d T g
 d th e lts of th s s p i t t a d that
 nt l ty l E w rd L C R. TEL MD

M ng t W F d St l t z R T t l A b d min l
 lly t c t my 1m J Ob t 945 49 63

T t l b dom nal h y t c t my p form don
 95 m m to l w h m wh t d dg t
 Th m j ty f the p t nt (593 p c t)
 m l th h p t l f m t to f i days b for
 l e t O ly 4 p t e p e r t d on
 th t ty f h r s of dm n Th m
 j ty f th p t (634 p c nt) d by
 st t s l t r d nts

Th p c p l nd at n f h y t t m v n
 c l d n h m v m f n c t o n al b l d g p e l c n
 f m m t y d b g d m al gn t n
 t m r s l m l g a n t e n t m
 Th u t j d om th q
 p r s at th t m of tal p e t S b e q t
 op t on fo mplantat o w y pa

t e t Morb d ty rat m la t th f ay
 h y t tom ie e p c t f th t y p f p e a
 t o

D th oc ed 38 o o p r c e t f th p
 t e n t s T ty n n (3 o p e t) f th f t a l t
 ccu d n th h r t h o l g cal h l f f th es
 l o (94 p c t) n th s cond l f c t f
 m t y p h s l y p t n t u t e d f f th
 38 d th

T t l h st c t o m y i a d g t l n t l can be
 perf mel th ut d e h a l b y u m n a
 t g f I C MD

ADNEXAL AND PERIUTERINE CONDITIONS

W y t t J Th Eff t f T t t r n P p t
 2 Ca es f O a r i n Ca in m J Ob t G y B t
 Emp 945 5 74

Th thor p nts c f v ca m
 t t d by u g r v i dat nd test t e p r
 p o t th l t r b g g b c f th pos
 b lty that t m ght n h b t h g ow th of th
 pl m Alth gh b th f th p t e t s e b j
 t e l y m p d th a n d c f g r e s
 the eopl m B th pat t d d f c r m
 J R W L S MD

P rk T J C ci m f th O ry Treat d Pr
 p t l y w th D p \ y 1m J Ob t 94
 49 676

Th ca of p p l l v c v s t d a ma
 p bl b ca f ma n f l t t t th
 s d n g t r u c t p e n t d b c th
 r p p r t l m d per bl b y d p r a th
 p I l l 3 a th pl m l m t d t t l
 b d m l ca ty The v p r f dly f t l
 the g app n f th t m r s b t a d r
 l t l ch ng the m osc p c t u
 l o f th p t t r e l e c f t ght l
 t l y r p c t ly the th d c m b d f r
 f i y r s t p p t l e l a t d c m
 D p r a th p th 3 p t l c a f
 the p p l l r y c nd t n l t t h k
 d th t m a t d m h b h c m i
 the p a t o n e r

Th s study nd cat th t t n t p r s t d
 d n g d f f i c u l t p m r y p t I m c a of
 m s f l t t o n t m v b f e r t t k a b p y
 clo th a l d m g d e p d p f m a
 eco d perat n at l t m
 Ed rd L Cor MD

EXTERNAL GENITALIA

Brady L M thods f Con t r u t i n g v g i l
 S g 945 5 8

V ag na m d f 4 me b t t h m th d
 d n a h ca d f f t l t h f r st th
 l b a m a u lly lo g and by t l g
 th m t pos bl t m t f th l
 m l g a th f th l m l th c l c a a
 g h ch h t d t f t r v f r l

var as mad tho t y op rat n The ntel
lg nce an i coop r t f th s pat nt play d a large
pat n m k ng th s procedu e succ f l In th
thrd c e the Whart n t ch que was f llo d
Th c n t d n m k ng n l ng t l canal in the
pe n m and keep ng that t be p n by mean fa
g n a l f rm of bal w od F l l w g th techn que
h ch Wh ton first mm nded th author made
n f lo t t c v r th ne l mad vag n w th ep the
lum In the fo th ca n xtens e pla t co f a
ton v as p f rmed in h ch the lab a m n o a w re
aga n e l t c e v wa s b t as th y e
n t lo g th s t j as uppl ment f b v us ng th
sk y of th perm m b t n th u th a and s
Th was c mpl hed by m k ng an inv rted
U shap d n c i n d s ctu g ut a flap b t v en the
th a d th ru and c ng th s fl p d eply
int the ne ly m d vag

Th thrd cas i th s e se was p t c l ly i t r
e t ng s n add t on t the m l y o g c l ab no
mal t cs f the ge tal t t the l an b
normal f f the u l g c l y tem The pat nt
nly k dney w l v n th pelv and wa m taken
by s v a l e am s fo th ute u The p robably
s n e b t m th d f mak ng vag a In th
w t r s op on n sh l d t k i t n d rat on
the anatom find ngs a d the t mpe m nt int l
l g c a d ma tal tat f the p t r t

C R L V M D

Wh r t n L R Spontan ou P f rati n f th
R t g n l S prum Fi W ek fte Con
tru ti n f th Vagina A S g 945
53

Th uth r state th t i struct f the g na
l ves th l cti a f larg p c b t w ce th
ct ma d bladd If th have be n f m un
s ful ft mpts to c tru t the g a the
n m l pla f clea ge pl d by d n ca
t sue Th s mak s th d cct o t mcl d ff lt
d und r these c rcum tance j s of th r
tum or bladd r have b n commo d na o idabl

The author reports a case in wh ch f for t n
occ rred five and on h lf veek f r a succ ful
oper t on and convale nce a d was due t the
pressure of the st ng p r n al m cle n the vag l
form hich pu hed the agnal f m th ugh the
vag nal vall into th rectum

From hi xp ri ce w th th s ca the a tho
concl de that

Th v g nal form hould n ve be o hort t at
t l es completely ab the muscular plane of th
p l v c d aph agm In th ca e the v g nal form w
so h rt that it d sappea d npl t ly in the l e
vagn Hen any pr x t d by the p l v c
flo was d r cted ag inst the nd of the fo m and
p shed the fo n high ag inst the ctum p ul de

f Do glas One s f gua daga n t th s accid nt
would be to have the form l g eno gh to p otrud
l ghtly f m the vagin l or fce A form f such
length could n t b pushed pwar l bv p r n e l
pr su

As cond safeg dag inst th s accid nt l d
be to m ke the ag nal o f h sol ge that it could
n t clo e o cont ct over the e d f the fo m It
sh ld be la g n ugt l all w the fo m to scap
f the int ap l v c p ess re i n c as d It sh uld
l ays be e y t re h and r move the v g nal
form Th vagu l f c ca be e la g d eas ly by
tt ng th nst ictor v g na muscle and th
p mal fibers of th peri cal f c Th s also
p eve t s dyspareu f t

3 Con t i t i n s to be v d d Th pat nt n
th s r port l d b n nst p ted If c nst pat n
ho l d d f p the p t e t sh ld avoid pres ure
to prod c d f cat n

4 Th method of l sur f the fi tul simple
No attempt was m d t d ct t th lay r f
the cto agnal septum a l o se pp im tion of
the t n edge was p v d d and th whol gon
v as put at c t by me n f a la g r c tal t b In
sp t f th unfortu te accid nt the ultimate r s lt
s n t n t r ly uns cces ful

H a f Th o M D

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Msey R D Randall L M nd Doyl L W
Pr gnancy f llowing My m t my Am J
Obst 945 49 5 8

The e per ce f Muss y Ra d ll nd Doyl as
w ll as that f th uth rs nd c t s that my mec
t my h s ry littl eff ct on the urs f f tu
p gnances In th r of cases the c d nce f
mplication f d l v r ncr s d om what b t
th m dern bst t ica dsu g calca e the nce e
k c t nly is not prohib t e In of th o
w m n pr g ncy occurred 67 t mes after my mec
t my w s perf med In 35 of the 67 tances
th p gnancy cont n ed t tem n l to t m
In 2 9 p cent of th 135 a ta ces the hld
r delc ed by es r an s t on l ev dent
the ef th t cesa ean sect as eq ed more
frequ ntly th it in an v geg p f l stetr c
ca es

It d fficult t ev l te th ol f ut in my
mas a cau e of infert lty thout the benefic fa
complet amnation f all f ctors nsl enc g the
f t lit n b th men and men Fr q ntly t is
not poss ble t in est gates safely tub l pten v in the
presenc f my mas which are p du g sympt m
The op on p a ls that the f til ty f w men de
cre ses n th pres nce f my mas Th f ct that
only 8 of 8 p tient h compl in d of fertlity
pri r to my mectomy sub equ tly c dw ld
s m to b in ag e ment v th t tat ment l
th gh th thors hav no kno l dge of the f c
t rs which may ha e contr b ted t the infert lty
It significant howe e that Bre nd J n s d d
n t find id nce of abnormal phys l cal ct t
f the o r s n th tud f th corp s lut m
d end met m n case of te in myom

A sal ge of 8 ch ld en n 67 nst nces f p g
n ncy mong 1 women who h d p rously d r
g e t rine myom ct my in t d f h v t ctomy
or rad t on f fib d m to j stify my mec
tomy in el t d ca s in which th p tients e
wom n f th hld b a n ge It is r ognized th t
ft r m me t my pat ent run mor r sk frem t
postop rat e c mpl cat s has intestin l b
structu n tha they do ster h y te ctomy whch
may be cc mp n d by p ton alization

Arn ll R E G ldm n D W d B ucci F J
Pr t in D fi enci s in Pr gnancy J Am M
A 945 7

The p ent comm nica t n is ch fly an att mpt
to answe t q est ns () what is th inc den f
p oter defic es th ult f d etar n deq
ces d (2) what is the pos ble ff t of ch d
fic ces th moth and ch ld

As ega ds the inciden the a th rs tr s th t
d m trabl d gres f p otein defi y r n t

comm b t subcl nical defic ncy f equ t Th
a e age daly ntepartum p t in take of 400 p
t nts of which 50 w e p i ate p t s (whites) a d
350 cl ic mat r l made up of 5 whites a d 2
egroe wa in est g t d It was fou d that 7 8
per nt f th 400 pat ents had p ot in ntake of
less than half f the optimum am unt r comm nd d
for the l tter h lf of p egnacy When calculat ns
based the id l w ght ather tha the
tot l prot n take in gams the res lts w r mu h
th ame 74 pat ents fell nto the d fic cy g up
th t is the daly t ke of p ote was less than
0 75 gm p k l gram of body we ght a ag nst a
d able nt k f r gm pe kilog am N th a
high intelligen e rat n ea y fi al circum
t nce p clud d th poss bil ty of def ct e dets

Since a qual tativ s well a q a tat d
fici cy may aff ct the nitrog n eq l b m f th
body it rec mme ded th t p ot n d r ed f m
an m ls rces consti t tlea t 6 p cent f the
total p ot n t ke O th b f the p ote c
tent the d tsw e las f d s vcell nt (d l m
tak of 8 rm egm of p tein) 95 p cent f the
pat nts g od (from to 84 gm) in 5 p c t
fa (from 55 t 69 gm) in 3 p cent poor (fom
42 5 to 54 gm) n 23 7 p cent d fi all ty
poo (les than 4 5 gm) 8 o p cent Th last
gr p r ed less th n h lf th amount m
med by th v t al R s ch Co ncl

It is a fair ly mpl m tt to d t mune th inci
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c c) In the type of anemia the administration of iron will be without effect on the anemia until the protein deficiency is corrected. There is no statistical evidence of eclampsia in this series however the high percentage of pre-eclampsia was in the deficiency group. The experience proved the fallacy of the habit of treating meat and eggs in the diet of the pregnant woman which was generally practiced in the past and is still practiced in some quarters at the present time. In the past too much attention was focused on obstetric complications and abnormality as a cause of maternal and fetal morbidity and mortality and to little attention paid to the general nutrition of the patient.

The ewingomaternal mortality in this series but a significant relationship was found to exist between maternal morbidity and the protein content of the maternal diet. The morbidity in the deficiency group was five times greater than in the excellent group. The fetal mortality including stillbirths and neonatal deaths also bore a significant relationship to the maternal protein. I take the percentage of fetal mortality for the five groups from the cell to vary poor be g respectively 0.22, 0.4, and 5.5. The greater we get maternal gain in weight during pregnancy in the deficiency group is explained by the tendency toward high gestation of carbohydrate diet when in the protein, it was low and suggests a high gain for the first trimester and reduction of weight during pregnancy. The absence of effect in the average fetal weight at birth supports the supposition that the fetus in tero is a true parasite and explains why the child's birth weight cannot be controlled by any known dietary means.

Here the most striking confirmation of the results of increased protein intake in this series comes from a study of the protein consumption of the same group of elderly patients who manifested evidence of protein deficiency. The patients were admitted to the hospital in the last trimester of pregnancy because of mass excretion of albumin. Further investigation showed the edema in all of them (18 of 20) to be due to a basic protein deficiency. I would not doubt that the tendency toward protein malnutrition is more likely to develop in older women and that it is increased by the strain of repeated pregnancies in rapid succession. In all these cases complete recovery ensued on a regimen based on replacement of the protein deficiency.

Thorsford then took the best means of repair for the protein deficiency (added to such a high protein diet as will be met by the patient's ability to utilize oral feedings) is represented by blood transfusions, blood transfusions supplemented by mineral salts to correct the anemia and intravenous plasma or plasma replacement by mineral salts. JOHN W. BRENNAN, M.D.

Ogilby J. K. Habitual Abortion. *Am J Obst* 1945 49: 633

Prior to the present treatment of ectopic pregnancy the cause of this condition was limited to months

of absolute bed rest. This was often ineffectual as often abortion during long immobilization.

The husband and wife should be subjected to investigation as painstaking as that undertaken in the diagnosis of sterility. There is a correlation between these two conditions. Women who are infertile because of ovarian failure are also who later conceive often abort as a result of the cause of the sterility. Appropriate treatment should follow the discovery of any possible cause of the sterility. The correction of a retarded placental circulation is best done before conception with the fitting of a pessary. Too much manipulation of the pregnant uterus may cause abortion. In the majority of cases however no local causes are found and the management resolves itself into measures aiming to correct deficiencies of endocrine and vitamins. The patient should be instructed to refrain from exertion on the days of her first four missed menstrual periods. Intercourse should be interdicted for four months. The entire subject should be carefully explained to her she should be encouraged but no absolute promise of success should be given. Because of their intense desire for children these patients are usually cooperative.

Pregnancy begins by intimate conjugal intercourse every four days after the first missed period. In case of any bleeding or pelvic pain the patient should be put to bed and the frequency of the progestin injections increased. Morphine is not indicated but simple sedatives can be used. For administration of anhydrous progesterone offer a more convenient method of therapy. Hamblen believes it to be as efficient as the intramuscular injection of progesterone. So let Krohn and Greenblatt concur in this. Still another method should be used because of its simplicity and economy. It is a further trial—that of pellet implantation described by Mishell. Interruption in the third trimester of pregnancy indicated by contractions or rupture of the membranes may be due to the preponderance of the progesterone. Progesterone indicated and may act as an antagonist to prostatic mature labor.

The twenty-eight of the 30 women who are habitual aborters went to full term or near term and treatment and gave birth to normal children. Uterine contractions were seen in 3 cases and in 4 cases thyroidectomy was successful. Maternal death of a pregnant woman treated by phytocally induced abortion does not guarantee fetal death in a subsequent pregnancy that untreated.

Two possible fields for the investigation of the cause of repeated abortions are (1) the qualitative relationship between the estrogen and coagulation factors and (2) blood incompatibility of the husband and wife similar to the Rh factor in erythroblastosis.

While the estrogenic effect of some mental activity denigrates the value of progestin to prevent abortion the author believes that the results reported by many careful observers warrant its continued use at least until better methods are evolved.

E. A. D. COVIL, M.D.

GENITOURINARY SURGERY

ADRENAL KIDNEY AND URETER

N. ti n E F R n al Ectopl A Study of 23
Cas Am J S g 945 68 67

Ectop: impl s congen t l d placement Ren l
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aut p s i The cl n cal cide ce is much g ater

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Pr gn ncy J Am M A 945 8 4 7

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W I LIAM W Sc rr M D

Lowal y O S nd Curtis M S The Surgical
A pect f Cy tic Disea f th Kidney J i
M Ass 945 7

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chi ocoecus cy t

S mple l cy t The term s l tary en l cy t
err n o s and should be repl ced by th term
simpl re al cy t

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ribb n gut N phrect my i ind cat d in nly

small percentage of cases

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f s j I K r M D

BLADDER URETHRA AND PENIS

A tscim r H L End m tri f tl Bladd r
J L I B lt 945 53 4 9

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J U l B l t 945 53 545

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t h n o p c e n t f t h c a s s t h v e s c a l d y f u c t
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M i l l e r J R P r i p o f t h U t h r a T t e d b y
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59

P l a p s e f t h e f m l u e t h i s a c l t l y r a c
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t I C MD

GENITAL ORGANS

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M l G B Id op t l G ng n f the S rotum
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C LE B v o MD

Ormond J K Cothran R M and Singi J A
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W M W S TT MD

MISCELLANEOUS

R yn Id L R nd W yra h H M U e of
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fecti ns J L I B lt 945 53 644

Th thors outlin a pl n f p n cll n therap
f ur g ita l f ctio This study is b s d n 509
g c cal a d 26 n g nococcl l fect on
N nety ght p r cent of the g n coccal group
w r cu d by th int am c l r dm t t n f
ooo un ts f p e cll n v th e h unt l

pa a t may b mpla t l n th c nt m t d
t u J L K c M D

BLADDER URETHRA AND PENIS

Kretschme H L End m t i f tl Bl dd
J U L B L 945 53 4 9

The lem t f th r nary tr t by end
m tr s unc mm but th bl dd r bet in
l epr m ty t th plic rg m y b fi ted
hs th t the rol g st ho ld bef m lar with
th p th log ale d t on a dw th th f ct that th
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Th f d m t i o i d ffic lt to e pla
o the b si of e th o y nd v dence has bee
g en the lter ture h ch upp rt ndr fut th
i theorie p c s ted

Th d ff ent hypothe s dva ced may be
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() th m t apla t c d (3) the migratory

Emb j ic ll y Th w lfian the ry w th re
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M t pl t th j Th osaep th l l th ory
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M g f y ll o y Th hypothes s um that
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Th ure c of e d met f th n ry
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H mat h pr t d g the me se
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As d m t s f q tly f d th other
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Th maj ty f th h stor s f th po ted ca
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M t uth rs e th t th nd ct n f n r t fi
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Emmett J L Tran r th f R t i f th
Tr atm nt of Tru and P ud Co d Bl dd
J U L B L 945 53 545

Syph l f the c nt l n rv syst m (cl d ng
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U y tent y gad lt wh ch formerly
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p a bnda cculta Th les n may pr d ce a m d
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hyp pl f the ve cal ne k l eith c e
t an ur th l res ct ll el e th c d it
E n th gh obst ct f th e cal ck t
Espe lly appa t o cyst cop am ton
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t uct oft n t appa ent ntl f t r th
ct n i begu

True d bladder h h ults f m a tr l
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p bl m l up ct lly l l c s the d t o m cl
hype t n c a d hype t phied to m leg th
bl dd t b cul t d res dual u e s p s t
a d th r s om t v p l t e y nco t
n c On the bas of th th y that th hype
plas f the p r t on f th det r r mu l d
the cal eck (called t l cal sph ct r)
m y be n p t p n s ble fo th r d l e th
p b lty f t u th l c s t ion s t t ct
d the sult m to b nc g g
Emm t nd h ass c t h be d p p o nt d
n th u f yst met dh b nd nd t u
as a d g t d l h bl th m cc r t
n f m t ca b b d f m th p t n b
t y by phy cal d e l g cal c am n t n by
d t r m n t of th m t f d l and
by c j t p m t on

Mill J R Pr f p f th U thra T ted by
th H pbu n Operati n A J Ob f 945 49
59

Pol p se f th f m l th a lat ely a
o d t wh ch h f i b b d m t f q tly

by gy c log t Ci cul n fth rrlaj l
m cos in a manne mlar t th Whit h a l o p e r
at o f r h m r h o i l d s a l l n f a v r f t h
supr p b e s p e n s n f t h t h r a a d i l d
ad cated by H e f b Th p r a t o n i m p l e
a d f e c t s a n d g e l s t g g o o l e s l t s t c a n
be p f o r m e d n l n i n c h i l d e b t a l i t h e
ag d a n d v n i n t h p s e n c e o f m k d l e b l t
It e m s p r o b a b l t h t h a n g u l t f t h
t h a w h c h s a m j l h e d b y t h s u s p e n n
p d u r e m v h v e a u f u l p l a c e i n t h t t m t
o f r y n c o n t i n c e h t h u c t h a n d i t
v o l u t v s p h n e t h a e b o k e n v f r m t h e i r
n r m l a t t a c h m e t t t h s u p p o r t f c
t h s v j h y
T l l t n 4 c a s e g e
f a L C M D

GENITAL ORGANS

L t c h m C W a n d E m m t r J L T r a n u r e t h r a l
R e c t n f o M n E i g h t y r M Y r s f
A g e J U l B l t 9 4 5 5 3 4 8

P r t t h e a d v t f m d e t r a u t h r a l r
s c t t h u t l o o k f t h p t n t w h a s h t y
m y e r s o f d s f f i g w t h p r o s t t s m
w a a b t d c o u g n g G e r a l e p e r e c e w i t h
p o s t t c t m y f o r m n o f s u c h a l a c e d a g a s s
t f c t o r y t h a t s u g e e l k l y t d
a c s l t i o n f a n o p e t

I c n t y e a r s c t h d i v e n t o f s u c c e s f u l
t r t h a l r e s c t t h t r f a r t i c l s d e a l g
t h t h s u b j c t h a h g e d p r o f d l y
E p e n e a t t h M y o C l i n c t h t h l
s t n t h e p a t f y a r s m h i n c c o d w i t h
t h p e c e f t h A g n o l g r e g d e d
a c t d c t t o p t a t i c s e r a d w e
k t h a t p a t t s f a d v a n c e a g e t l e r a t e
t u r t h l r e c t a l m t s e l l a s y g r
m

D i n t h m e y s f r m 9 3 4 t 9 4 l
3 4 5 p t e t s f e i g h t y o r m y e a o f g w e
t r e d b y t n s t h r a l c t i o t h C l i n c
S n t y f o o f t h p a t n t w e h t y f i o r
m y a r s o f a g e a d 7 e n e t y m o y s o f
O a d m i s s t h v a l f b l d o f 7 6 f
t h 3 4 5 p t t s w s m e t h a 5 0 m g m p o o c c
h a s f 2 i t w m t h 7 0 m g m p 1 0 0 c c
l 5 c s v e s c a l c u l u s v a s t d w t h t h e
c d t o d i 4 a t u m o f t h e b l a d d e l s o
p s n t v i c a l d t c u l w p e s e t 3 c a s e
A o l d b e p e t e d n a r o f p t e t f u c h
d n e d g t h c d e c f s s c t d d w
h g h F t a c 4 2 p t t w i d d p o o
k f g l p l r b e a u f i c a r d c d
e T h d h d e e b c u l a r d n t s p e
l y a n d h d p a l y s o f t h l o w t m t i e s
T w t y o f t h s p t t s e s s i f e g f o m d a
b e t s m l l t T h e w r n m u t h
t d d s e

T h c n c f p t a t c m l g n t l s o s
t h g g u p f c a s e s i s t e s t g I 4 (3

i c t t l t i s s e r u m v d a t t l t t f r e c t i n
a m l a n t l 6 c a s e n t i c l u l l t h e r 4
t l l v l t h a t t h j t a t s l f t h y a l c
a n t v t t h t r e v e l r j o r t l t b c
b g n b t l j a t l l g s t
T h e d o u b t t h a t e f t l g r a t t f a c t
h c h e t r i b u t t h e l w m o b d t y a n d m o r t a l i t y
o f t r a n e t h r a l r e c t o n t h i s g r o u p o f g d p a
t t s i s t h b f i r c j e r a t l p s t p e r a t
p l f h o s p t a l i z a t i o n J o n y A L e M D

M i G B I d i p t h l G n g n o f t h e S c o t u m
L n e f L d 9 4 5 4 8 4 0 4

I n a c a e o f - c a l l e d d p a t h c g a n g r n f t h e
c o t u m c n e r v a t v e m e u r s i c l u d i n g t h e l o c a l
a n d g e r l a d m s t r a t n f s l f a m i d e
a d o p t d w i t h a s u c c s s f u l r e s u l t A m r u t a b l e
t e m l d b e c t e t e g e f t h e r c r u m
s i n c e t h i s i u n l u b t e d l y a m a n f s t a t o f
i n f c t o n a l t h o g h a v a t y f g n i m m a v b
e p o i b l e

A n a n a l y s i o f t h e 2 4 r p o r t e d c e s a s m a d
f m t h p o n t f e o f g i n c i d e n c b a t e l o g y
a s c u a t e d l e o n i g n s y m p t m s a n d c m p l c
t o n s p r o g n o s a n d t a t m e t

C o n r v t m e t h o d f t r a t m t a r e u f f c e n t
l e s t h e g a n g e n e s p r a d s i l e l y s n t h e c r o
t m r a p d l y r g a t e s n c o m p l c a t l c a s

C L E B A R O M D

O r m o n d J K C o t h r a n R M a n d S i g l J A
O p e r a t i o n f U n d e n d d T s t i c l J t l
B l t 9 4 5 5 3 6

T h e t h r s p r e s a t a t d v o f 6 o p r a t f
d e s c e n d e d t s t c l e T h e m a j t y o f t h e o p e
t (7 0) v r d e b y t h l a s t i c b a n d m o d i f i c a t i o n
f t h B v a n p e r a t i o n I s s o f 7 0 c a s e s
w h i c h t h t y p e o f t r a c t a u d u c c a s b
t a n e d n o r p e r e n t i a r s f 6 c a e i n v h i c h
n o t a c t n a s u s e d 5 3 p r c e t p r s t p r s c c e s s f l
s l t T h e F e k t e c h n i q u e w a s s e d n o n l y 5
c a s s t h e r e f o a s t a t t c a l c m p n i t h t h
C b t N e s b t e l t e b a d p r o c d e v u l d b e o f n
l e

T h e t y p c l t r a c t o r u f e o p e r a t i o n d e s c r i b d
i n c o n s d b l e d t l R t e c m a d e t b t h t h e
n f a n t l n d d l f t y p e s o f h e n a l a c o c t
d t h t h e u n d e n d d t t c l H n a a s
e c c u n t e l i n o o f t h o 3 c a e

W m W S t r M D

MISCELLANEOUS

R y n l d L R a n d W y a h H M U s e f
P n c i l l i n i n t h e T m n t f U g n i l I n
f t n J L l B l t 9 4 5 5 3 6 4

T h u t h o o u t l i n a p l n o f p e n c i l l n t h e r a p y
f u r g n i t a l i n c t i o T h i s t u d y i s b s d n 5 0 9
g o c c a l a d 2 6 n g n c o c c a l n e c t o

N n e t y g h t p r c n t o f t h e g c o c c a l g p
c u d b y t h i n t a m c l a r d m t t n f
o o o u t f p e i l l e v j t h e h u n t l

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Hatch r C H The De l pment f Sarcoma In
Bon S bj t d to R entg n or R dium Ir
radiati n J B S g 945 79

Roe tg n o ad um irr d t n suffici nt to cau e
p hel i chan es has be n f llo ed not inf eq ently
by the de l pment of rc noma Although les
common th n arcinom coma in s f rical
lce t on of a a lat d feld is also a well kno n
omplicat

The e r r p o t s in the l t rature of 24 p tients
wh d eloped bone sarcoma f llo ing exposu e to
d at on S t n of th e tumors res lt d from
o ntg noth apy f t be cul us arthrits On
foll wed similar tr atment f acute arthritis In 6
ca b sarc ma foll wed e pos e t rad um

Th e ca p r t d by th author are rega ded as
bone room It g f m th irr ad iation of bo e
fo earl r indepe de t tum r amely a gant cell
tumor of the tib: a similar tumor of the w t and
a cancer of the breast T o are chondro arcomas
and r s a fibrosarcoma w th tumor cartilage

In all of the cases repo t d n the l t rature except
the am unt f rad at on w s l rge nd w sad m
ster d n fract al dose over a long pe iod The
interval b t een the irr ad iation and recognition of
the rad t n p oduced sarcoma is l ng The
med an t me in the report d cases was s x yrs

There is the possibl ty that th new t m rs r p e
s t recurr nce or metastas s of the o g nal t mors
I cases nd the ntal les s were cons dered to
b ben g p phyal tumors Oposed to the idea
th t the s b equent sarc m e presents a regional
ecurrence latent metastas of the pr mary tum r
th long t rval bef the arcoma was ev d nt
l case s n years and in ca e 2 l v n y ars
el ps d bet n the erad cat n of th b ngn tum
and th app a ce of the rcoma Als futi g
th dea of l cal recurr n e the fact that in e ch
case th e coma de el ped not at th s t f the
o gual t mor b t n p eviously n mal bone
Latent m tastas s f om the o gual gr wths can
rdly be th e plan tion since the s d t mors
we cl mally d h tolog cally diff rent from the
gual es Mor ove irr ad iation suffici nt
dest oy th first neopla m h ld have d str v d
y metastas in the same fild In ca e 3 n
quest on f eg n l r curr ce or late t metastas s
can be as d because the p mary t m wa car
inoma of th b east nd the late r b t m chon
d os room The e m y be some d bt th t the
pot rperat v irr ad t n ca s d th b tum
c app ntly r l t v ly l t l l rr d tion was
d Al o the r b a e a common t f chon
d ma nd h d os c ma wh ch ma gr v l ly
nd t p d c v mpt m f a l g t me II

e r chest r entgenogram made at the time of
ma tectomy tho gh not n w available w e r
p rted as normal It as prob bly more than coin
cidence that chondrosarcoma develop d in a rib
within the fild irradi t d for carci ma of the
brea t

The presence of chro c nfection in all the ea ly
cases of roentgen s rcoma of bo e led most of the
uthors to th conclusio that irr ad iation of chron
ically i flamed ti s e v as re ponsible for t mo fo
mation In th author s m terial cas and case 3
h we l no infecti n In case 2 there wa local bone
nfection follow ng ulcerati n of the sk n wh ch was
d to roentgen and rad m therapy Th infect d
t sue as n v irradiated a d the ontgen sa
coma arose in b ne wh ch had not been infected

It is true that occa ion lly malign nt tumors
dvelop in chron call y infect ed bone wh ch has n t
been subjected to irradi ti n These tumors how
ever are us ally carcinomas develop ng in chronic
ulcers or in epith l ed sinu tracts Sarcoma for
mation in chron call y infected bone n t posed to
radiation is xt emely rare

One of the most inte esti g facts ab ut entgen
ad um nduc d sarc mas of bo e i the larg
p oportion of ca tilage form g tumors Th s is true
of sarcomas p oduced in pe m ntal nimals as
w ll as in human be ngs Ch nd osa coma occurs
m e f equ ntly amo g d i tion p oced sar
com th n m g other bone tumors

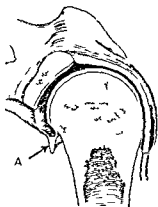
Jo H K NARAT MD

N via e J S Adh l Caps liti f th Shoul
d A Study f Pathological Finding In P r l
arthritis of th Should J B S g 1945
27 2

Per arthrits f the shoulde has l g been fam lar
to orthoped s geo s Oth r n nces applied t
th cond t on a e frozen sh l e stiff n l pa
ful shoulde r pe iart c la adhesions tendinitis
f the sh t ot to s adhe nt sub crom al bur
s s scapul humeral pe r thrit a d Du
plays d s as The cl n cal p c e is cha cte i ed
by pain and l m t ti n f mot n in abduct n and
n both t nal and te nal r tation

The consensus of m st of the many r t rs on the
subj ct may be ummed up n a few p t nent stat
ments The cond t on s egarded as a separat
clinical tity Little is kn n of t path log cal
chng s a d expos e of the bursa in few tan e
h revealed no con ist nt abnorm ltv Motion
w resto ed only iter dh s ons had been over
me Th dh es ons we e p oably in the sul
stance of th tendinocapsular structur

Th t dv was und tak n with th hop th t
thro gh s gal e ploration of the sh lder jo t
om lght c ld be thr wn n th p th lgy f th
c d t n I such ca s the ope at v f dings



f h th dh f (A) th gh th h ld j t
f th cap l

t d and m r e d d m to
j ctures a ell In d d to 63 h lders f 36
pe n h o d f o m a cau es e posed
at a t p y nd pec m n re tak f m cro-
p c studs

With exc pt on th pat nts s l t d fo op
t n h o d o ch ang n and b t th sh ld
j nt up r nt g n g ph v m nt n Th e
cept on e ld al heat n n th h t tat
cuff

Th h lders f o pat nts uff fr m
f o n h lde p arthr f th h ldr
e xpl d at pe t n Cultu s tak n fr m
th j t e n gat In o ca s the cap l
as o t a t d a d l ly l he ent th h me al
h d t t n te f o p r t n Adh n
r d c ab l t th flect d f l d f c p l d
t l t th n t m cal ne k I r ca e th caps l
ld n t n p f e d g th m n p l t o n a
true n th th e o ca s l th gh n t al spe t n
ant r ly ev l d t t be t Afte man p u la
t o n h e r th caps l could be p k d p l o e
ly f o m th a t c l a cartilage Th cau of th s
d f f e c c u l d n t b u al ed thr ough the pe
ti c i n In ca a te o s y n o t i f the lo g
h d f the b c p t e d n was ob r v d

The t ns of burs and c j l taken f o m
th h lders l d m r c p cha es
th r b th h lders Rem l f to f
a t c l r ca t l a e d co t u d f r 4 h d
h n p c t r n s t t th the u l d g n r a
t ch ang fr m d t e r

The eult d m n r t e th t th les on n t a
p th t b t th t th t l p th l g c l
cha g th cke ng d t t c t f th cap
s le wh ch b mes adg e t t th h me al h d
M c o c e p t n h th p e s f
p at fl m mat r v h g th ap l l
m a e s th e a l o m l h g i th l l
f th b c r m l b r s D r g m n i p l t n f

f h ld u l a th th c l l
parated f o m th h ad m h th am v th t
adhes pla te n be to n y fr m th ba
kn O c th ep at has o c u r e d m t n f
th head w th n th jo t i fre
The t r m dh e caps l t suggest d a d
c u p t f th pathol cal cha g f f o a
h ulde C s r p o s t s ph t m g ph a
t m cal d c j t o and d n g s ar p e s n t c
R n l M r x M D

SURGERY OF THE BONES JOINTS MUSCLES TENDONS ETC

M ye d g H W Th Tr tm nt f B nig G t
Cell Tum rs by R t o n o e d n d B ne
Graft ng f B 5 g 94 7 96

In 92 p r nt f th 4 ca h ch th a t c l
b d the pat e t b t t n d fifty ye rs
f g e The h i t o r y f a i g l e j v s l c i d n
52 per cent f the c e s nd of m l t p l n j i 5
per cent l 8 per c t th v m p t o m s had b n
p e s e n t f l e s than th e y e r s and in 58 per t
f l e th n a y r

Altho gh the d gnos of b nig g ant c l l t m r
u lly can be m d o th b f th h t o r y a d
th ch c l nd ro nt g e og ph c f d n g s m cro-
p c am at o n mo el bl

C ettag f g nt c l l t m r h u l d n s t f
m p l t c In r d t c m p l h t h t
r v t h c a d r y l d nd n pen l g
e u h s th t th f the l c n b d f e
m n e l d e r v p a t l of tum t i s e m d
C m p l e t e m o a l i n r v Fu th m r th
s u g o n m t l t b n f h h the p posed
gr f t t be b t a d u u a lly th gr f t t k
f m the t i b h b l a l m r f i m a nd p o t
f th m o l d b n Alth gh t g b o
g a f t s p f d h m g g a f t s ha be
e d t fill hu e d f t

A h m o h g m v cau ou c m p l e t m s
n e c i s w h c h t m p o b l t a t q e t
th g n s h o l d b p p d t p a k the t y
Wh n such p c d s r y gau p c k
m p g n a t e d w th petr l t m a d s u l f th a l
s e d a d th d s u t e d i l y e r s Th p c k
m y b l f t n p l c f k d th p a t o may
m y b o m p l t d a t th e n d tag M
e c c e t n f th n l d b a lly perf m d
i ca e s n h c h th t m t t d th d e
u l a f i b l Wh th t m l g d n l e s
th t b o f m l g b n g f t s a q r d l
h a th b t r u t s d h n g s g l i y
b t a d f m th t b a

Th best lt bt i n a h h th
t pack d h m l w th a t g u b a l
wh m p l t t r d b m m o b l i z a t n f
th t m t n p l t f P c a t In ca e s
h c h th tum t t d th g n f th k n
th a l l g h t b g h l d b l d t l
th nt g g a p h m n t d l o s f f e t
d p o t i n f b t t d th t d t f

the joint is a h ch th a t cular cartil g s
e po ed the s of pporti g strut s adv able
and t: llt fill the int rspace w th h a i g and
canc lous b ne An l et c bone employed
f r th r mo al of th tuts dash p ch s land
cu t e us d t bta h vngs Aft r the cavity
h s b en p ckel ith bone th periosteum s s tured
he erpo ble and th nd is closed snugly in
layers Bl dy dr n g e sh ld b d l as it
may le d t nfect r to t myeliti i h ch
c th g fts may b lo t Fr k i f ction d l n t
occ nanv c n th c s although s al pa
tie t had e s d ch arg f short per d
ulc rs i on result of pre i s rrad ation
In the p t ters h e empha iz d the da g s of
h mo rhag h ck and infect Modern a eptic
rg ry ha to la ge xte t elm at d these
complicat n

The ty eght of the 40 p t nts btaine l g d
fu ct l l t Three p t t ha l d from
one to e e y rs ft th operatio N c fth se
sh l any evide c f m ta tasis resulting from
th t mor

H l y G H nd B ck L W Cellophan in
B e nd J int Su g ry t J S t 945 68
9

Three cas s ep nted i h ch c ll pha as
sed s an interpos g m mb ane ith good r sults
In none of these as ther a y evide ce f i dura
tion or fore g body r acti Wo d h al g as
pp ently n rmal

These ca d m t at th d ty f
d t s in wh cell pha c b utl d as in
t rposing memb a

C i The adh t e t or tendon of the in
d fi ger was d s t d f e nd pr ted fr m re
dh i g by m a s f cellopha e h t pla d b
twe n the tend a d the joint

Ca e The alh t tric p s t d t th lb
w d s t d f r a d eparat d f th d ly
i t ssu by means f llopha

C 3 A do l gy t w em v d d
l ph n w int rpo ed b t th rad us nd
ul to p e t ecu ce

The a thor al o d cibes the f cell pha
ft r y ct my f the k ee repo ted by
M Kee Dc H L n M D

M k e G k M t i An st m is Tub In T nd n
S t La f L d 945 48 659

C t t d s ho t gte l n y t t d
lth gh th d able ti p et l ad t dhe
t th u ou dng t es e n f th d f
th te d a pp mat d Th m e accu t th
pp m t n th fw th adh b t f a y
pp oed cut r f c tend i m ban l
f fib ous t ew l f m t t s t

Acc t pp t mat on nd fivat o by B l l
m thod f t r wll g e f i m un but th t re
te h calo e a d f t l d to f y go f th t n
d n dur g ts i to

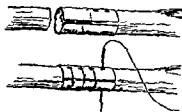
With early mov ments the sut r is liable to giv
ay and ith early spl nting adh s ns are liable to
form—c ns quently most of the cases whichev
m thod has been employed have resulted in failures
The princ ple of f i ction of the tendon ends until firm
n tural rep r has taken place a d the princple f
m intenance of funct on by ct ve m vements s m
t be opposed to one another An attempt has bee
m det r concile the t vo by the us of a metal anas
t mo st be and at o-stag procedu e

The t be into h ch the cut ends of the tendon can
b in erted s made of f i e gauge malleable nonc r
os e m tal It s in long a d usually i in d
d mete It is spl t n it wh le length so th t it can
b removed later and t has several holes p rforat d
in its s des through hich s tures can be passed (Fig
) The tendon can be anchored within the t be by
tures passing through the perforat ons on one sid
th ough the tendon in the tube and then out
through the perfor to son the oth s de of the tub
Lately a mod f d type of tube with k ck up
pikes i its lumen has be n used so as to avo d th
use of sutures altogether (Figs 2 and 3)

Th t nd nend arl cated and th n th prox m l
po tio i pulled down as far as pos ble ith th
wri t and fingers fully fl xed and tran f d with a
traight n edle s fa p imally s i t e posed
Th seem to be the best way of hold ng th prox m l
end with a min mum of trauma f ps e l ble t
cau e c s derabl d mage to the tendon The pr
fundust ndon i ential and th s s the only meth t
t ed The sub l m s t nd n s c t way so as
t a oid adhes o s between the t The sub l m
tendons apparently giv only add tional trength
an l firm ss of g up to the fing rs

In th w y the tendon ds a e pproximat a d
h ld tgether in a metal t be The straight through
d th ough sut es or the pr j ct o prev nt
f ying f th t d and th ncas ment in th t le
t om te t p ev nts u d s ble adhes s to th
urr nd g t sue The tendon ends un te ead ly
n th t be with fin l e cars and afte the tub s
ha e b en em v d the un on i s ccurate that it is
d f ficult t mak t wh r the tendon h d b e
e ed B nd f fibrous t ssue actually grow out
th gh the p f tions n the tub and these hav
t be d ided at the econd stag f the p cedue
h ch i unde t ken s m fiv we ks late Du ng
th first thr e eeks of the int l of five e ks b
tw the t o st ges th f i g r i k pt spl nted in
lght pl t r s to allow u t t ke pl ce th
t y t an th s t ur l ne

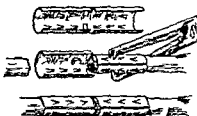
Th econd stag f the p oced e mply c sts
n pos g th t be rem g th utu c (f sutur s
ha b u d) nd then pen g th t b al g th
li f the slt and l rem ng t fr m th t f
t m The adh s ns that ha form d
nd th tub r divid d and th tend n is l f t
mplet ly fr The adhes s are oft upr s
ngly dens but the enc clement f m tal ound
th t don do ke p th s t of ana tom s s f
The d gital sh th s n t sut d at ll and the



F



Fg



Fg 3

I Th l m thod t us s gl split b
th perf t t th gh whch t ld be
pa dt a ch th di ded ds fth t d
F T pbt tubes h bee sed wh h b t
ta ned t th t d f the t d d m in th by
aso f th m ll po ted p j t (k k p) th
l m Th tw t b ca th be ted t th d
so h ld the tend d app um t d Th m thod

t v ry sat f t ry beca f the clips which w
q t b lg t th des f th t b
F 3 I th f test m th d tw sh t split t be th
k k p r co t d by rr w b d Th t d
d imply la d th pe d t be wh h then
l ed i th m Th y m h d ly so f
th k k p In th w yall t a d lip d
d th t be ed ly m d t th se d t ge f th
p at by p up the lit

w und s cl ed by sut r of the skin o ly A tiv
movements r sta t d ne t day At th st p thes
can b d ne qu t v gor u ly t hout f ar that th
tendon ends ll me p t

So f nly r cent injur have been d alt with by
th s method nd f lpa : e mo ements f th d gts
we e pre ent bef the op ratio S cas s r
r ported

Two med an nerves we app x mat d by a m
la method the tube be g used to su r nd th n
rv but th sutu e d d not p r f ate through th
n rv th y were p t n w th v y fin small cu d
needles p s d th r gh the ed of th sheath f the
nerv and th n t th ough the adjacent perf rat ons
of the t b on th same d and th n t ed o t d of
the tube

Plast r casts w e finally appl d nd at th
s cond tage th rve had un ted w ll The e
pairs b b en made too re ntly to al at the
f ct onal esp ons

Sta nless st el has be ome the m t al of ch ce
because th re v as ome d c lor izat on of t s e ad
ja t to th t l m u d

The utho con l d that th r ults w th th
method ha e be n f l y g od O f the a es of
d ns on f the fl r pollicis l gus was a c m pl te
succ s and the th r a part al fa l e

Th te hnical d t is may r q e l ght m dica
t ns n th fut P b bly the ut es will b d
pens ed with and th split tub with l ttle harp
points p o j t n to ts lumen (Fg 3) ll be d
nste d so st cause th minimum f t a m t th
t nd n and p t the f rmat i adhes ns er
th s te of st mo The del m t l ha n t
vet be f nd but f r th xpe m t a be g
m d th o types f t s t i nd th r
all y R s F M r OMER MD

ORTHOPEDICS IN GENERAL

Leona d D W The S gn fican e f d l yed O
ficat n n th T tr nt f C g nital Cl b
f t f P d t S Lo 945 6 379

Att nt on has b en call d to th f ct th t del y n
heato of the f r al b ne m y be n mpo ta t
f ct n th o e ca es of clubfo t h h h b
f nd t r lap e f r o t n et eat m nt fo th su al
l gth f t m An ul s of a ens f r nt g no-
gr m from cas reco d has b n tab lat d and
c mp ns ba b en made by the s of a pro-
p ed s ficat ion d x fo the foot The f cts th
btain d nd cat that d layed os ificat s pres t

an app ec ble n mber of the children hos
t eat me t h s n t b u c ssful by the p e e t
c ns rati method Medicat on w th thy od
ord r to acc ler t bon format on h b n g
gested a a adj ct to the us al o tin f su g cal
t atm t The co t ed u f the os ific t
dex d r g t atment h s b en d cat d as a
m n of d t m n n the e d f r m d cat n th
p gress u d t eat m nt nd the l timate p g
o s

If the p ocess f o ficat the tars l b es
hold th cle to th p oblem f t e tment fo cl b-
f o t a d f the atment t b th ght of a first
a c r ct of th def m ty and e d a pe od of
wa ting f r th el ments f th f t t th
f p sh p like l gpl t e th t d i dual t me
h dle f s hecat on s f p ma imp ta ce It
ill n t be n ght t y f m th m at n of
e x ay n gat nt t the al n mb of os f
cat on nt s p nt t ll be neces ary t sho
by peated t g g m that th n w c f r
f pe n th ut d l ith t i n f m
these e ters p gres ng at th mal t

For the normal foot the average ages for the extremities are normal, but for the appearance of the center of ossification:

Calcaneus
Talus
Cuboid
Tarsal
Carpal III
Fibula
Carpal I
Carpal II
Navicular

B
B
B

3
4
4

Each of the average figures which admit of variation are not averages, but are border-line ages by which which delay is definitely pathological.

Clubfoot appears at least twice as often in boys as in girls. It has also been noted that the rate of ossification is a normal average in boys, slower by a little more than in girls. A relative slowness of normal ossification has rarely been found coupled with arylactylgite and calcification.

Tratman is most likely to be successful if treated early in the child's life. The fact is of interest in the present study because it definitely places the deformity in the proper perspective in the treatment of the bone of the foot. The physician is faced with not only a rapid process of ossification, but a most critical stage in the treatment of the bone.

If repeated observations of the ossification in a case under treatment show normal ossification, a good prognosis can be given, though it is noted that the deformity is not so likely to reappear after the cessation of active treatment.

Chronic metabolic disturbances are common in children with clubfoot, and the delay of appearance and retardation of the ossification in the centers of all the metabolic disturbances is a factor in the management.

Endocrinopathy are the most notable, and of these hypothyroidism has the greatest clinical significance. Wilbar concluded that calcium phosphorus and vitamins are important food elements in bone development.

Extensive changes in addition to delayed ossification in cases of hypothyroidism emphasize the importance of that endocrine gland. In many of these cases the bone changes reach an extreme, designated as cretinoid degeneration. The chronic cases have evidence that after the usual delay in appearance, ossification finally develops from multiple centers, thin, single bone and mottled type of ossification is the result. Under therapy with thyroid substance these abnormal are rapidly become normal, and the centers that appear and get cemented are normal.

The fact that thyroid medication for periods as short as six months will bring about rapid normal ossification in these cases, which is due may be borrowed as a basis for the medical treatment of any patient in whom delayed ossification has been discovered. Thyroid medication is then indicated. The natural fear usually associated with the use of thyroid substance is a pitfall with a supposedly normal basal metabolism may be dispelled by accepting the fact that delayed ossification is in itself good evidence of a lowered metabolic rate. This finding, stabilized with x-rays, therefore, is an indication for thyroid, even unrelated to the treatment of clubfoot. Medical treatment for the purpose of speeding ossification in children with clubfoot, though the period when the bone is being held in their normal position thus become a matter of giving adequate daily doses of thyroid substance with extra thyroidal chlorides which this medication demands, and with the ethical assistance of a diet rich in calcium phosphorus and vitamins. A

and D
R P M TIGMER M D

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

H nt J B Ilgatu f the Patent D ctu
Arteriosu B f M J 945 73

Fourteen cases h l i g t of a p t t duc
tu a te us a p r f m d a p o t d T l
e un m p l c a t e d b y n e c t o n a r d n l y a
d c a d t s p e e t f f the pat n t s e f
mal s The g s v a d b e t e n f i and th t y - o n e
y e a s l t h u n o m p l c a t e d c a s e s the pat n t r
a l l s l g h t l y s t u d t n g r t h the m a j o r i t y r
b r e t h l s s e r t i n n d l y r h e d s g n s o f
c y a n o s

I t s t o s o o t k n h a t the u l t m t r s l t
i t h e s e c a s e l i b A l l f t h e p t n t h a l t
t h e r d y s p n o n e c t i n n and h a v m p d n
g n e a l h l t h a d p h y i q u f o m n e t o t h r y e s
p o s t o p e r a t i v e l y T h r k a t t d a n t p o t h p r
n e o f a n u n c o m p l c a t e d p a t e t d u c t u s r t r
h a e o t y e b e a c c u a t l y a s s d b u t t h a t t h e
s a d e f i n t e k o l i f c t o i t h a g a p o o n s
i s n q u s t i o n b l

T h t v n g o f the d e c t s t t h pat n t
c c l a t o t n n l t h b e t h l s e d s a p p a r s
t h a p p a a c e m a k k l y m p o e d a n d a o t i c
a b l e c h e f r the b t t r o c c r the pat n t
m e t a l c d t n

T h o p r a t i e t c h n q u d i b e d
S x f M D

S n J H M r p h y G E d N w m n E V
M u l t i p l C o n g n t l A r t r i e n A n r y m
i n the P u l m n r y C i c u l a t i n B H J h H p
k n s H p 194 76 93

A c a s f m u l t p l c g n t a l a r t r v n o u s a e u
r y s m s i t h p l m a y c u l t i n p r s e t e d
T h e d a g n s t a b l h d b y a n i o r a p h y a s
f i m d a t a u t p s y a d t h p a t h o l o g c a l f i n d s e
r p t e d

T h c l n c a l p t u o f 6 r p o t d c a s e s s m
m n e d T h s l s y m p t o m e k n e s s f a n t
n and d z n s d y p n h s t p a n and h m o p
t y i s T h e s r c y n s c l b b n g f t h f g r s
f i e n j b l h m a n g o m a s b r u t o r t h c h s t
p l y c y t h e m a a d x j e d e c o f a l c a l d
p a c i t y n t l n T h e d s c a n b e d f i t l y
e s t a b l s h e d b y a n i o r a p h T h t e t m e t s p u
m n e t m y

A b i f d c u s s g v e f n g r a p h c t c h
n q u e n d the p h y s i c a l f f c t o f p u l m r y
r t i e o u c m m u n c a t n A n g i p h y h a
p r d u s f l p r o d u b t m a y b d a g r u
n a p a t n t t h c r c l a t r y s h u t f m h t t
l e f t h a r t

A c l n o p t h l o g c a l l y m d f p
u s l y p o t d c s e s t o e t h r w t h t u t h s
h e r r e p o r t d i n h h d a t h o u d t h n
t u o f t h n t r a t y e t i n o f d i d r a t f

d g o T h c l s r a c h d s t h a t the n t r a
e s u f d r s t s h u l d b e p p o c h d i t h
c a t o n t h c a e o f p a t e t w t h h p e t e
c a d o e n l d s e J i t k i k a n i c M D

H o d G B G r i m s n k S a d S c h l e b e l H M
T e a t m n t f v a i v b y S t r i p p g E
c l i n d E u l o n A S g 94 73

H g h a p h l g a t n v s t p p g d t h r
e c n v u l f t h e e t h p u
b d g n d a l y a c t y h a p v d f f c t
i t h t t m t f a g r u p o f p a t e n t t h a d
a n d p a t h l g c a l c h a g s o c a t e d i t h l b
v s c T h y r e m e f f t e t h a l g a
t n a d i j e c t t h r a p y s l e a l i n p a t e t
t h m a l a d c e d p a t h l o g a l c h a g A
t h o g h the o p a t p s d l a g a s f s k n
a d f t e c a e d o u t n t h p n e f o p e
u l c e r s t h a t f n f c t n l

P r b a n d a d e l y a t t y m a c u t
f o t h e b f p l m a v n b l s m d p n
t h o m s

T h a p p a n c f m a l l a r c o s t s
h a l f i t h e p t t i t h h r i p o d g e t s
t h a t s m d f c t o f t h r m a g o b m l
t y f c r u l a t m s t l l i s t

S u t k i M D

S m i t h y H G c m p l i c a t i n g F t r f t h S r g i
c a l M n g m e n t o f v r i s e v l s S g e
945 17 59

S m t h y p o i n t s u t t h a t s c e f l t r a t m n t o f
a r i c o n f t h e l g d e n d u p o m p l t
o b l i t e t o n o f t h e p n l c m p o n t f t h e u p e
n c l e n u c i c u l t n d m y h a z t h t t e
b e t r e u l t s a e b t a n d o l y b y a d c a l t c h n q
H h i g t n and d s n f t h p h n y
m b r e d w t h t g r a d h m c l s l e o s e
e e t l H a d t t h m t h d i g g t d b y
P r t t b y h c h a u t l a t h t s p a d d
t h d t l v e n u g m t f f o m 4 t 6 o m T h
c l r g n t n j t d c n t o l y a t h
c a t h t s i t h d r n

H d s c u t h a m p l c t i n a d l l
t e t e t h e m t h c a t T h a a n t m
c a l a r a t o e t r m t t t y i h i c h c a t h t e
a t n d f f i c u l t t h r m b p h l b t l y p h g t
d e l l u t c l r s d p o s t p e a t
n o s p m

R e c t o n s t s c l o s g g e n t l d e c d
B j u G o o r M D

O N H E E L i g t n o f t h l f r i v a C a v a
i n t h e P t i d T r a t m n t f P u l m r y
E m b l i s m v E g l d J M 94 3 64

T h t r u p t f d p n p t l a y s n t h
t e a t m t a n d p e n t f p l m a r y e m b o l m
h m t o b a r a l l a c p t d g a l p

turbating influence of constant low g of the oxygenation in the inspired air.

The polycythemia associated with the anoxemia of high altitude is absolute in type. The level in the total blood volume is due to an increased red cell volume. The polycythemia observed in arrhythmia at high altitude seems due to factors of decreased red blood and hemoglobin concentration, while that due to a repeated red cell count exposed to a low pressure environment is related to a erythropoietic hyperactivity.

The polycythemia associated with constant or intermittent anoxia tends to show a proportionality in the circulation of reticulocytes and in the serum bilirubin. The stimulating influence of no anemia on the hemopoietic system restricts the formation of red blood cells to a degree. Chronic anemia does not modify the erythropoietic activity permanently.

Comparative study of the polycythemia of high altitudes and that observed at sea level indicates that in cases of the latter due to pulmonary changes the polycythemic response tends to be less than with corresponding degrees of arterial oxygen unsaturation at high altitudes except in cases of Ayerza's disease. Such comparative studies also suggest that the causative mechanism of polycythemia is not related to the existence of a toxic stimulus.

WALTER H. ADLER, M.D.

D. G. Wain, E. L. Th. Possible Role of Whole Blood Transfusions in Military Medicine. *J. Am. Med. Assn.* 1934, 7:137.

Since the introduction of the modern treatment of shock, the use of whole blood until it is commonplace in most hospitals. Blood has become more readily available through the development of blood banks and it is commonly believed that due to its use hemorrhages are more properly treated, hemiparesis without operation, but some infectious diseases and shock from hemorrhages are cured.

Since 1938 attention has been directed to the therapeutic possibilities of plasma and serum transfusions. These plasma transfusions are effective in the treatment of hypotension and of secondary shock. The army employs in immunotherapy. There are many objections to the use of plasma in the treatment of shock, but in all agree that the importance of the treatment is to restore the circulating blood volume. Whole blood is used but many workers now say that this is beneficial if it is directly to the plasma components and that the erythrocytes are unnecessary and not stable and dangerous. Plasma possesses the advantage over whole blood of being more stable for storage and not requiring compatibility tests prior to administration.

With military interest in the use of secondary shock on a large scale, many opportunities for comparison of the therapeutic advantages of both methods are being obtained.

apparent that the methods which are effective in civilian practice are not necessarily applicable in warfare. In civilian practice the degrees of shock are mild or moderate and treatment can usually be instituted promptly but in warfare the degree of shock is often much greater since a long time elapses before treatment is started. Fully recognize this probably accounts for the failure to conclusively establish that plasma transfusion with hemorrhagic shock could be treated effectively with plasma or serum.

It is now becoming evident that there are several distinct clinical types of secondary shock—neither of which monoanoxia occurs as seen in burns, a crushed leg, and another in which hemorrhagic contraction occurs as in shock caused by hemorrhage. Serum and plasma will restore the circulating volume in both types but if the blood loss has been great the plasma is not necessary to a degree unless whole blood has been administered. Both the literature and casual cases conclude that a pint of blood should be given for every 2 pints of serum plasma—no observation on subcutaneous infusion in the American forces.

In civilian practice the University of Iowa Hospital has a general hospital with a blood bank having quantities of whole blood and plasma available. One can gain some perspective in this direction from whole blood transfusions. In 1933 3,618 transfusions were administered—1,743, 335 were whole blood and 60 plasma. Only the indications for each transfusion were recorded and of these a tabulation. It may be possible to predict the duration of whole blood and plasma; an actual military installation from this experience. The plasma patients will be undergoing major surgical procedures and the incidence of secondary shock will be great. In military medicine 50 per cent of the cases of hemorrhagic shock are caused by hemorrhagic action, a preferable method by whole blood.

Frequently in warfare the requirements for treatment are limited to be fed. The ease of administration, stability and universal compatibility of blood plasma are well known. These features make it preferable to the time of secondary shock, military transfusions. In this question of plasma transfusion, while blood transfusions are not practical in military service because of the time required to collect blood and the lack of quantity in the personnel and equipment and the difficulty in procuring donors.

Emphasis of the following three procedures has made possible the application of whole blood transfusions; (1) the use of (2) the accumulation of blood to be given (3) the transportation of blood and (4) the administration of group O blood to the patients before any of the blood is given.

A young surgeon in a hospital with a blood bank with 1000 gallons of whole blood available for use. The advantages and disadvantages of the use of blood in warfare. The advantages of the use of blood in warfare are: (1) the use of blood in warfare is a life-saving measure; (2) the use of blood in warfare is a life-saving measure; (3) the use of blood in warfare is a life-saving measure; (4) the use of blood in warfare is a life-saving measure.

establishment where surgical operations are performed on seriously wounded men by a limited personnel

Transplantation of preserved blood now is limited only by the distance attained by airplane in the maximum time of preservation of the blood. The United States Army maintains daily transposition system of blood transfusion from coast to coast by European theater personnel.

Ottengren in 1911 proposed the universal donor principle of considerable controversy about its feasibility has been aroused. Rarely a blood of group O may contain agglutinins of such potency to react with a component of a heterologous group. Though transfusion of O blood has been given to recipients of other blood groups in civilian and war practice without an immediate indication of reactions. This is an immense advantage in military medicine. The group of the blood can be determined at the point of collection by trained technicians and then it can be employed as determined by its plasma at the point of administration without the delay equipment or personnel required for the laboratory tests. Not only satisfactory but also it is safer than the trusty compatibility tests done without the presence of urgency which frequently surround the emergency transfusion of blood.

Military organization must solve certain new problems in handling preserved blood in addition to the problem of supplying plasma to medical installations. Collecting depots must be established far enough in the rear to insure adequate donor supply. It should be equipped with facilities for adequate blood grouping. Refrigeration must be provided at the collecting depots during transportation. At the dispersal points accurate timing and distribution of transportation facilities must be maintained. However, now that these problems are being solved by the American army it is now possible to employ preserved blood of group O in the same manner as plasma administered in the field. In ambulance work, blood should be used in the same manner.

R. T. R. B. L. M. D.

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f. O. Cell. Res. pend. d. St. ed. in 10 pe.
cent Corn Syrup. J. Am. M. A. 945. 7. 096

Resuspend dried blood cells 1 ft. after treatment. Blood has been centrifuged and the plasma with drawn has been treated in 10 per cent corn syrup at 5°C for as long as two days and administered with satisfactory results to 437 patients (figure 1). The unexpansion interval for four days has been established.

Jau. de. o. a. y. o. t. h. r. del. t. e. r. s. f. e. c. t. has not occurred and the nonspecific fever chill effect on rats is corresponded in the different hospital that the method is own bank blood.

These transfused bloods were effective in Ashby's gelatin test. The well known in the components of the blood in a

de. t. o. citrate mixture which has been stored for the same length of time and longer than cells in isotonic solution of sodium chloride.

When the red cells are used the clinical results also indicate that transfusion of centrifuged cells resuspended in 1 per cent corn syrup is as satisfactory as transfusion of whole blood.

JOHN W. B. VAN M. D.

Mu. th. R. O. Concentrated Red Blood Cell
Preparation and Use. S. H. M. J. 945. 38. 33

As a result of the increased demand for plasma blood banks have been left with large quantities of erythrocytes which have been discarded. This has resulted in a 5 per cent loss of the total material collected. Attempts to utilize this material have resulted in the development of several new techniques. Utilization of erythrocytes.

Red blood cell suspension

a. Dilution—1 cc equals that of whole blood
b. Concentrate—cell count doubles that of whole blood

Red blood cells as surgical dressing

a. Red cell sludge
b. Dehydrated cells (powder)
c. Treatment

Red cell suspensions are those in which the red blood cells are suspended in saline solution to concentrate in proportion to that of whole blood.

Concentrated cell suspensions are those in which the red cells are present in approximately double the number found in whole blood.

These suspensions are used as dressings for wounds.

Cells used for this last purpose may be prepared in one of three ways: (1) a sludge which is packed on the wound; (2) the cells are dried by lyophilization and used as a dusting powder; or (3) the cells are incorporated in an ointment base. Tragacanth and heylrescin have been used as a base by Mu. y. and Shau.

The preparation of the red cells for surgical dressings is relatively simple. It consists in removing the plasma from the cells and then drying them by process described in the authors' laboratory and present general modification of the current procedure used for these purposes. The particular arrangement used all with complete drying of 350 cc of cells in approximately four hours and makes it possible to dry such amounts in one working day by multiple use of the apparatus which is sufficiently simple in construction to permit application one may dry considerable quantities daily. The powder has been found very satisfactory as a dressing or as a 5 per cent ointment in a special base consisting of the following:

Cetyl alcohol	15 gm
Wheat	gm
Polyethylene glycol	gm
Sodium lauryl sulfate	gm
Water	720 gm

B. JAMIN G. LIDMAN, M. D.

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M r J S HERT MD

SURGICAL TECHNIQUE

WAR SURGERY

Harris R. I. War Wounds The Present Status of
The Treatment of War Wounds J. 1945 52
45

Infection is the distinctive problem in war wounds. The first important contribution to wound treatment made between the two World Wars was the control of infection due to hemolytic streptococci. Since these organisms were secondary invaders which always came from the nose and throat either directly or indirectly infection by them could be prevented by appropriate dressings or by early closure of the skin. Part of the merit of W. A. Orr's closed plaster treatment was due to the exclusion of secondary infection. Second in importance was the introduction of ulfamid. The third contribution was Trueta's closed plaster technique which applied W. A. Orr's method of treating otitis myelitis to the treatment of war fractures. This technique not only excluded secondary infection but also enhanced the efficiency of local defenses by barriers by splinting of the soft tissues.

In this war penicillin has been found to be a magnificent therapeutic adjunct to the management of war wounds now and then.

1. Early and adequate debridement. The wound is enlarged by longitudinal incisions which eliminate and provide adequate exposure. All dead, vital tissue and foreign material is removed. Perfect hemostasis is secured.

Dressing is provided by sterile vaseline dressings into the depths of the wound.

3. Fractures are reduced by manipulation. Steinmann pins or Kirschner wires are inserted if necessary.

4. Plaster is applied—it should cover the wound and its dressing completely.

5. Penicillin and sulfonamides are administered orally and intravenously.

With such methods it has been possible to close about 80 per cent of the wounds within two weeks of the wounding and to have the great majority of these heal by primary union and maintained.

SOURCE: K. H. M. D.

Edwards H. C. Review of Early Wound Closure
Two Stage Operation as Applied in Italy
Lancet London 1945 48 583

In Italy in the last two years of World War II the treatment of the deep wound and by delayed closure as practiced as a routine procedure. Primary sutures big are reserved for wounds of the face and scalp. The remaining two stage operation has been used to treat compound fractures and lacerations of the extremities. On a hospital basis of 100 patients it has been found that the mortality rate is low. It is something of a gloss. More valuable is justified by the following facts:

When a missile enters the body not only does it provide transport for pathogenic organisms packed up as it passes through the skin and clothing but by damaging the tissues it creates an ideal home for these organisms. The object of early surgery is to wreck this home and make it inhospitable. The forward surgeon does this by removal of clot and foreign bodies by excision of grossly contaminated and devitalized tissue and by providing for unimpeded drainage through free incision of the skin and fascia. He will further increase the inhospitability of the wound by using a bacteriostatic. The success of this initial operation will be apparent in from two to four days if there are then no signs of acute inflammation in the wound around the wound the object of the operation has been achieved.

After the delayed result—a wound which has resisted attack by the organisms is usually introduced—is obtained the next obligations are to get the wound healed in minimum time and to prevent reinfection. These obligations are of course closely related. Both may be fulfilled by closing the wound which may safely be done when there are no signs of inflammation. Nothofriede now began and by leaving the wound open and much may be lost. The presence of fracture is no contraindication on the contrary it makes early closure even more desirable.

This is the whole operative procedure may be conceived as one operation performed in two stages—a preliminary debridement to guard against sepsis with a waiting period to determine its success and suture preferably between the third and fifth days.

From the pooled experience of senior surgeons who have served with both the Eighth and First Armies a set of rules was drawn up.

1. Debridement of wounds at forward units must be thorough.

2. The dressing must not be disturbed during evacuation from forward units to base hospitals unless the indications for dressing so are absent.

As suggested in putting in sepsis means infection. This is the rule which has been hardest to enforce. Chances so led for a clean dressing is a natural impulse difficult to resist. That insistence upon this rule justified has been recently shown by Lieutenant Colonel Bentley and Major Scott Thomson who found that 48 per cent of 163 wounds dressed during evacuation were infected with pathogen as against 33 per cent of 60 undressed wounds.

3. The first dressing must be done under aseptic conditions in the operating theater. The optimum time being from three to five days after the initial operation.

4. The wound must be closed at once if it looks suitable bacteriologically. Minimal bacterial growth is a criterion for closure.

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f a h t h a m a s u b i d s t a n t f c o p e c n t
c e t h t t a g p e t

Th t h n q f r d b y d i f f t r g r l f
f r c n s d a b l y l t l u g h t h d f f e n e r m r
t r n t h m Th p t n t t t a l n t
t h e t h a t t l l t h a s t a l r n t t h b a
h r t a l t h a n h t t i l T h e t
t h m a d i t h l t p a u t o s a t
f c t r a n d t i m a k t m p b l
m y d t f r n t t h a l s t h a n d u

S p r f l l d n t h h a b e n a l q a t l
d a l t h t t h r e t a t g e - j l y a l l f t h m
h b n - a r d t b d a h t l p o s b l A
i r e c n h r m l f t a f t

l o n e a f t t h b l d e l t h a b e n g e n t l y r e m o j
Th d g e s f t h n d a r e p a r t e l f o m t h
d r l y n s t r u t u e b y b l u t l t a n d b r o u g h t
i t o a p p o t n b y t r u p t d t u e s I t s m y
t n t t o o b t n a c c u r a t p p o t o n o f t h s k n d g
I n d e p e r o u n d t h t r a c t e x p l o e d n o t o n l y t
m a k e s e t a t r e i s i n s n e d e d b u t a l l
p p a e t h s t f r t h e r e c p t i o n o f p e n i c l l t u b e s
D a a g r a r l y e m p l y e l e c p l a t t h e a n l
f t h e s u t u e l e f a m a y a m p u t a t B u d
u t u a e o d d a s f r a p o s b l e

W t h e e r f c t p e i a l l y t l e o f t h e f
m u r t h r i s t l c y t o l e l a s u t u t o b t n
t h e s i t h a n d t h d y d i n o n o t h p d c
t r a l a r g p t r r l n i f q u e n t l y u s e d T h
h v e r i o o f t h m a y i a t o s u d m g

r g A c r t a n a m u t f t s p m t l l
b t h s k n l i c d a b l t h e d g a
b h t a s c l o s e a s e m a d t h p t
c m p l t d a f t e f i v d y b y h c h t m t l t
p e s i b l t s e u r c l s p p s t n W h k n l o s
g e t - b u e f p r m a y l s t c n v t h e m

s l f f a r d s u h y r c o n r v t w t h
s k i - a s m p l e f l a y m a y b u i o r p t h l l
m a y b p d e d b y i m m d t e p a t c h k n g r a f i s
A f t o p a t n t h l m b r t a t r e t a d a s a r u l
t i t l t u b l l r t t e l d a y a f t e h h
t h s t h e a r e r m l t h e o p e r a n t h e a t r
W t h d p e r u n l h o e f t h e t e

a l t e t u r e t i n c a g l y t h c u t m t m k a n
n e m s p e c t i n t h o p r a t n t h a l t f i e
d a y \ d r p e c t o a r p m t t d
t h a l s A p t t n b o t h a b o n i b l t h e
k e a r e p a t u a l y u d f t h t e h q u e o f d
l y d s t u e l r d d n s t j c k r g s e l

a t t h e f i r s t t g t h e s c o n d s t a g e e y m p l e
T h b s t m e f t p y s t b e a b t t h e f r t h
d a y b t t h f l p m m m b l n o g h i o r y a p
j m t u j t t h t h l y A h n i e d
h h s m d t h p r a t g t h a t r t h e
c l t h d l l r y f r e c t s n

f a o c u t a f o t s o p e t h a l
g a s b t a i n f t d a l L u t n n t c o l -
j j M D o u l l W d j l g t t h e h a r
a l o l l s u t d t h d d a y d u t u e t h e r c
W h n a m p t a t o n f t h e n g r s s n r e s r v f r
a r d s t p r r y l f t h e b l e k n c

t t h b f l b t h a t a g o d f l p
a l y a n l t g t b u j b y t h e g a t t h e
b a l t h m m t f i l r u d - p e
a l l y m y t a t t l t t h e m p o t c
f t h l l o d i t t t t b t h r t h

t c n t t h h m l b t h h m t r t l
a a d t h p l s m a f t l l h j a l q u i l d
t h f l t s f l S l k f l a m p r o t
m t n l l d f a t t d b b l o d
t a f u a b f t h i t h f t h p d r e
a t t m p l e d

The m l l t a l r t
i A u t f l a m t n t h u l r f t h
t e r l t h t h f b j e n t
n o t A d t n l t n r l y u

suit d f any uch unl sh v nos g s of
 flammati and pv g c organ sms ar n t
 m re c mmonly found in th m than in w unds
 h ch look clean

Th preenc f g s th t s ues

3 A e s i c l s of sk

A delaye s t r e h ch is l s s than 50 p r c e n t
 s c c e f u l r e g d e l a a f a l u The common
 c a s e s o f l u r a c e s f t e n v o n a t the s u t u r
 l a n d p r o b o t h T h e p o s i t i o n o f f l r e s
 w l l a y c o n s d b l y a c c d i n g t t h e c r a f t m a
 h p a n d j d g m e n t f i t h s u g e s I f f l e s c o m
 p l e a l a t t m p t m a y b m a d a f t e f r e l m
 a r y l o c a l t r e a t m e n t u s a l l y t h p e n i c i l l i n I
 p a t a l f a l t h e u n h e a l d a r e a m y b e c o v e r e d
 w t h p a t c h g f t I o t h e c a s e s a g i n i t m a y b e
 b t t a t a e k m o r e d p r i o r i n a s o d
 a r y t T h i s t m u e d t o d c b e t h e o p e r a t
 a n n q d h e t h m d u r i n g h c h d l a y e d
 p m a r y s t i l l p o s s i b l e s l l e s t t n
 d y s h a s l j d l t i d c a t e d t a y t m e f r o m
 f t e e t s i x t e e n d a y s l a t e r T h g n l a t u n t i s
 s r e m e i a n d t h s k d g e s a r e c i s e d I e f
 f t t h l d u h a l e d o u d s r p l a c e d b y n e w
 t h h m m d a t e l y c l I O f t e a f l a p i s
 d d n d f t h u d s l a r g e a n d q e m o r e
 t h t a a g l l f t h e g c r a l s u r g e o n t h c a s e
 t r a n s f e d t o o f t h t w m a l l o f a c i l e t r s
 t h e C o m m a n d O c c s o l l y f a l e s d u e t o t h e
 t n t o n o f u n s u p c t e d m t l f g m e t a l o f
 r s e s o m e t i m e t o s e q u e s t r a b u t n o d s a l
 l d t o r m a i n b e a l e d w t h o u t g o o d c

A t l e a s t f r m 7 0 0 0 t 8 0 0 0 w u n d s m o n g
 B t h a d i d a f f i c e r s a n d m e w e r e c l o s d b y
 d l a y e d p r m a r y t r e r e c o d a r y s u t u r e b e t e n
 M y t a d t h e d f 9 4 4 T h d a t a h o w
 t a b l r r e d e d f m n a a l y f 3 8 4 5 p r o
 f o r m a s d s g n e d f t h e v t g t n A g h d
 n s n t o t h r e t a d a d f h a l g h a b n m a d

G a d t h f m o o t g o p c n t h l i n g m
 p e d n i s h e a l e i b y f i t i n t t n o w n d
 h c h d r y f t e e d y f t s u t u b t n
 h c h a m l l p t f i t h u d o t t c h h o l e r
 p e l l t h o l e a s h l i n g u n d a s c a l C a e
 s t k n t o n c l d e b u t p o v d c a s s u n d e r
 t h h e d g

G r a d I I w i t h f m 8 g t 5 p e c e t h e l g c o m
 p d d s w h h e a l d i t h g t p t b u t
 h c h t r e a s o m e g a p d c h g (p e r
 h a p t h g s t i t c h l s) f s e u m p M t o f
 t h e s h e l d p o t n e l y t h a h t t m o
 d e d h l p r o m p t c h k n g r a f t
 G r d I I I c w t h h l g u l e r 5 p e r t
 r g a d a f l M t f t h e m e r e h
 r l y l t f i l e s f e b k e f w c m
 p l t l y

I t l l b e s t h t o f t h e c e s t r a d b y d l y d
 t p e t e r f r a c t s h s f t h
 c a s e s t l b y c d r y s u t p r e t
 f c t T h b c u s e h g h p p t i n f
 f a c t u c a s a u u t d f d l a y d t n d
 b e c a e t h r s a l g h t l y h i g h p o p t n f f l

TABLE I —PERCENTAGE OF HEALING IN
 APPROXIMATELY 18 000 WOUNDS

		Dela d P m ry			Sec d ry S				
		T tal	G d 1 (100%)	G d 11 (80%) (d r s %)	G d 111 111 (d r s %)	T 1	G d 1 (100%)	G d 11 (80%) (d s %)	G d 111 (d s %)
All	ds	5	(6 %)	(37 %)	(5 %)		(76 %)	(6 %)	(33 %)
C m p o u n d	f r a c		(7 %)	(3 %)	(9 %)	69	(6 %)	(%)	(%)
F l b	d	3 006	(8 %)	(58 %)	(6 %)	5	(68 %)	(76 %)	(%)

re of d l a y e d t u r e n c o m p u n l f r c t r e s s e c
 n d a r y u t u r e b i n g f r q e n t l y a t t e m p t e d h e n d
 l a y e d u t e h a s f a i l e d A s u c c e s s f u l d e l v e d s u t u r e
 l o k s i t s b e s t f e d y a f t e t h e s t i t c h e s a r e
 m e d A s t h e w e e k s p a s s t h e s c a r s p t c u l a r l y o f
 t h e l g r o u d e g t r a d a t e s c a r s o f t h e b u t
 t o c k o f t e n d e v l o p a g o d d e a l o f k l o d f r m a t n
 d b e c o m e r e d a n d u n s i g h t l y O f t e n t h e e p i t h
 l u m g e a v p e c i a l l y a t t h c t f s c a r s r
 o v e r t h f i b r o u t c k l i n g f o m t h p s s a g e f
 t h e m s s i l e S u c h s c a r s a r e v e r y t r o u b l e s o m e t h y
 m a y a l m s t i d e f i n i t e l y d e l a y p a t e t r e t u r o
 h s n t n c a t g r y l S m o t h e a n o b g
 s u b j e c t d t o f u t h e r e x c s i o n o f t h e s c a r t s u e i t h
 i m m e d i a t e r e p a r T h e r e l a t i o n b e t w e e n t h e a t m a t
 c a l s i t u a t i o n a d h e a l g a s s n e s t i g t l b y n a
 a l y f t o o n n s c t v e c s s i t a s n o t e d t h a t
 w o d o f t h b t t o c k w r e t h e m o s t t r a t a b l

U n d e a l c o n d i t i o n s t h e s e r s l t c o l d b e v e r y
 g r e a t l y i m p r o v e d b u t d e a l c o d i t i o n s n e v e r o c c u r
 i n w a r I f t h e y d d t h w o u l d b n p r o b l m n
 t h e t r e a t m e n t f w a u n d s a d p r m y s u t u r
 c o u l d b e u s e d a t w o s t a g o p e r a t n w o u l d r a r e l y b e
 e e d e d I t f c t a g a i s t t h c n d i t i o n s c r a d
 b y w a r t h a t e c o s t a l y b t t l i g u e r y
 a d t a c h e v s u c c e s s t h d l y e d s u t u t h e r u l s
 e c t e d h o u l d h a v s t r i c t c o m p l i n e O n e
 f a c t t h a t h o p p l a y i s t h a t t h r i s k f c l o s i g
 f r a c t u r h s b e n e a g g r a t d t h e p a s t P
 d e l t h l e b y d f r a c t e s d s m a y b
 c l s d a f l s l y a s f h o u d s A d t h e y s h l d
 b e c l d a f l e s s l y f o t h e n e d i s g e a t e r s p s i s
 s t a b l h e d n b u a l l y c o m e s t o s t a y

T h e s t a d d t r e a t m e n t o f w n d s f b o t h f l l
 n d b e f c a d h a d c e p t d t h l t a l n
 t h e t e f s a t w a g e p e r a t C t n
 u l s m u s t b o b e y e d i f a h g h m s u r o f s u c c e s s
 i s t b e c h i e e n d d a s t e s a r t b e v o d e d T h e
 r e l t f t h e t o s t a g e p e r a t n 3 4 3 5 w o u d o
 t r e a t d u r i n g S e p t e m b e r a n d O c t o b e r r e c d
 d t t h e r w t h t h r e l t s n 4 o d s t r a t i
 b y l a t e c l o s u (s e c n d a r y s u t)

Brown J J M W ds of th S ft Tl u Tw
St g Treatment L I I d 945 48 588
Penicillin as a local bacte static has o v l
tonized the d l yed c sur of soft tissu ou ds
that the tw st g meth d h s b come f mly estab
lish d as th b t form of therapy Of 72 wound
sutured with the use f p n c lin po d r p n
c lin inst latio only 62 (86 per ce t) h v e b e n
con ider d fa lu Success d p e ds first d fore
m t o ad quat primary gery No b cter
stat c how er ffect e mu t b e l w ed to replace
tho ough wound excis o The s lts of the two
st ge treatment re a tr bute to the w k of the su
geo in the forwa d ar s Ch E B ROY MD

C n e J M Ea ly and L t T m nt i G n
l t W und of th Jaw In F nch B t l
Ca ualti s in N rth Africa and Italy J O I
S g 945 3

The t atm nt f gun hot ounds f the j w m y
be div d d to three d t t pe od the first o
ea ly ph se f bl d l sh ck pai a phy and
m ntal d p ss n th s co d or prer co tract
phase whe imm b l t o of th bo fr ments
and c ntrol of inf ct n are of pr m y imp ta
a d the th d o co tract v ph s p e

In the first o rly phas the co t l f h mo
hage th l e f re pr at y obstruct on a d th
t eatme t f sh k b y transu o s e t land
lif v measu s Primary ut of th w nd
is not dv sed deb d ment although spa ng
should a m at th emov lof d italized t loose
b n f agm t d f g n b dies Imm bilizat o
f the remai ng f agm t sh l d b done by impl
m ns such as l tu ires l a t s

At th s c d stage d hnt mea of imm biliz
ng the bo e fragme t (spl t rch nd b nd)
re u d Wou d inf ctio ntr l l d b v ga
tio pres ed ss gs nd b t i tates Wh n
the wound cle p k and d oid of ed m lat
primary sut should b d ne Oth r p blem
h ch may equi att t n at th m i c d

r The e t action of t th the l n f f c t r
Th s should be do e wh ne t oth s d p i d f
ts blood supply d bef re co i f the pulpal ds
t uppuratio

E t m l d in g Th ind cated o ly fo
the acuat on of l l cted pu of large hema
tom

3 Lat primary ut of o d r comm nut
ed fractur This may p t s q c trat n of
th s denud d fragm nts

4 Extern l fix tion f the b f gm nts This
is occasionally d cat d t mm b l d nt lo
bo f gme ts

5 Th f iot os s i This is h l pful
t chn q f r mm biliz gf t es f th m d b
lar ng when th e m ked d pl c me t f the
p t edent l fragme t

I th th d r con tract pha pr pe ea ly
t eatm nt m y b tly s mply the r tructi
s rgical proc dur t to c ft ts s a d b ne

The r o stru t o f s ft t ss s must be m
pl h ed first Pa t l d fects f th low r l ps can be
r t red th l cal fl ps h le la g r d f e c w
r qu re the bing g n of t e fr m a d sta ce by
m a s of ped cled flap

The co stru t o of bon by means f bon
g ft r qu s the p enc of w ll vas ul r iz d
o car d oft t u All s of s p m st be
absent and compl e immob l atio I n graft g
must be ssu ed Bo gr fts may bet ken f mth
nternal spect f th l um and m y be sed th
form of ch p small fr gm ts h h a e p a led
solidly to the d fe t r s a carv d block h ch
u lly ed in pla Occa o ally a b ne strut
surr u d d by b ne chips su d The ave g m
for the o s l d tion of bone grafts s ab ut t
r ths

Th fi l st p ar o stuct ne s ts s stor
n the b cal sul us to f man lve l r d e h ch
all p m t the w r g f a p osth s An lay
g aft wr pped r und m l d a d held i pl e with
a spl n t sed The spl t su lly ttach d t the
t th but in edentul ca s t may be a ho d
with ta l s s t el w r p ssed th ou h llayers a d
t d verg u z

The author s p sentat o b sed p sene of
63 ma l l f cal ca s d th r g l a t d c t
t s 34 photog aphas d dia ms f g od q lty
a d cla ty J r J McD o M D

Ayl tr S O d Al p A F S rg rya d A
th si f Abdomin l W W u d B t M J
945 547

Th s art l r po ts the t catm nt a d anesthe s
f a ser s f m s l u d of th abd m n s e n n
th forw d a e caa durn the p nt camp
Eur p Appr tely one fourth of th w k f
the f a d surgeo l kely to be c ncernd ith
th s typ f njury W th the e pt n f f c
ll those wh ch w re oper t d n w egve p t thal
a thes l Ste s made n th g at ced
of a h h g de nesth t t to accomp y f r w d
surg ns The d a s s and t m nt of gun h t
wo ds of the bd me re disc d

Th am nt of t nsl o eq d to re d a
pat t fit f r op r t on m st v r y a c d i g t the
s v nty of th l cal s w ll as th ssoc ated injury
It the am t mp veth bloodp es to m
mum f 6 mm d st l d co mm ystol

Pe t th l d m was ch s nastes leanesth t e
th cau t w s b l d n th beg n in to b the
best but b cause t a th nly drug a l b l d
f l d co d t n Eth r s co d d harmful to
t suff r ng f m a m due t h m hag
nd hock p n l n g c d e red d a g s
e erely h k d pl ch c lg w
t m o s m p l s p nt l tion f pe tothal
s sed d l cry tall t h d o red
th ed y old s l t w fo d sefficac as
tho e e ntly p p d A t m at o f th co
d t noth p t t w a b d ch e lly o the l t c
blo d p ssu e Wh n it w s b l 7 mm f m

ery a moderate degree of shock a consid
present I such patients an induc dos fr m
0.2 to 0.25 gm of ne total w s adequate

R espiratory depression occurred in those patients with spinal shock who received more than 0.5 gm of an epidural dose.

Hecups occurred in cases that required large doses of pentothal.

When the population was administered intravenously, the results were as follows: it was found that with established block of any severe injury there was a very slow absorption from any other route.

Postoperative complications were few and included a case of vomiting, a case of pulmonary atelectasis and 3 cases of pneumonia. Of deaths in this series of 200 consecutive battle casualties in which the abdomen was explored in 56 cases, only 6 could be attributed to the anesthesia.

With this form of anesthesia a great improvement in the ultimate recovery after perforating wounds of the abdomen could be claimed but at last the mortality was no greater than with other forms.

The perative procedure a d p t perati rse
d scussed in d tal It is th op of th
a th s that pentho I has been fou d to b an ideal
th t f r abdominal urgery in sh cked pa
t t While this drug can be used ith af ty
wh n th so ly a mild g ee f hock and wh
la ge do ha e to be given t s difficult to c tr l
d ca t b r commended in th cases

MARY KARP M D

Co ke W T P n y A L P Th mas G Elk
J J nd Oth rs Cl tridi l Infections in Wa
W nd La l l d n s 48 487

Clostridial infection of rodents in human subjects
is essentially a well-known problem. The local spread
of the infection to persons can be adequately studied
by following a suitable controlled experiment
methodology. In the field, on the other hand, the nature
of the infection system and reaction can be investi-
gated by examining the effects of potential in-
fectious agents with close observations.

From series of 68 wound men from the
 1st Front group of 76 cases with syst m cr
 ctions ha eb n studied All b t 4 of this g p
 h v d ide c of clost d al o g m n their
 wound The g p h s been s bd d n the ba
 s f th ver ty f the system c act o nt f ur
 ct s f ncre s g s v ty th last c str g f
 f tal es Th fatal ses 7 f the se arc and
 8 f th moderate group gav a h stopatholog cl
 p ct u of cl t d l m os tis

Poss bl sig nificant f t res th boch m cl
 fi di gs w lo bl od h l ste l d hgh u ine
 cr ti el eis Ac d s d d not appear be greater
 th g pth oth wou d d men While th
 h m t l cal t d e sh le d c f h moly
 t i n s m c s se e h m ly wa t
 f t ny Flocc l t n of chl m r s o

current in a number of cases but this is not specific for clostridial infection nor can it be attributed to the direct action of clostridial toxins.

At autopsy the fatal causes extensive fat embolism of the lungs and other organs, as demonstrated and demyelination was found in the central nervous system.

It is clear that the systemic reaction in the reported series of 76 cases cannot be attributed to the effect of clostridial toxin. These are however almost certainly a major factor in the 2 fatal cases and it seems possible that they played some part in the systemic reaction in the 7 severe cases and 18 moderate cases in which the histopathological picture was one of clostridial myositis. In the remaining cases it is most likely that the part played by the clostridia in the production of the systemic reaction was negligible. The blood findings evidence suggests that the products of tissue breakdown may be more important factor in the systemic reaction than circulating toxin.

Such concepts of the nature of the systemic reaction to clostridial infections could lend support to the view that adequate surgical removal of necrotic muscle from the wound, the most vital measure in treatment of the systemic reaction. The lack of dramatic effect with antitoxin would be expected if breakdown products are largely responsible for the systemic reaction but antitoxigenicity alone and large doses might have some protective effect since it prevents the breakdown of tissues by clostridial toxins *in vitro*. It is clearly impossible to attempt any assessment of the value of chemotherapy in these conditions from this small group of cases but it is probable that its efficacy will be limited in the absence of chemotherapy.

JOSEPH E. NARAT M.D.

Boland F K Clib n T S and Pa ker F P
Trench Fo t S g y 045 7 564

Th a thors p sent an analy is of th i obs rva
t ons n i g cas of t ch foot submitted to their
ca e d i g th Italian c mpa g Among these
ca e e e f mmers n f t the clinical cours
of wh ch could not be d st nguished f om that of
the ch foot

The predisposing factors are those of continuous exposure to wet and cold usually with a dependent position of the feet and circulatory stasis. Wet socks and previous attacks of frostbite were also considered to be etiological factors.

Painful and swollen feet were usually the earliest symptoms. The swelling often appeared before the pain. Numbness and burning were other symptoms and weakness and coldness appeared late. In 5 per cent of all patients the pulsation in the dorsal pedal and the posterior tibial arteries was absent.

Sk n b ops est ken f om pati nts without ga grene but w th persistent symptoms revealed an increased f mat on of collagen Th s was most m rk d in the pap ll ryl yer f the d rms and in th row d g pap ll blo d els

Fr m obs rvat n f th group f pat nt tap
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prod es ry ng d g es of capilla y d m g h h
m nifest d b y d m a d c a d heat po th
esumpt on of a ti c lat n In e ta ca es
wh ch dem pers t chr c i f m m t n ith
d flu termal fib os f d nd nm e
cases nonp gres e dry g gr e dev l ps
Simpl con rvati t atm t d d n th
p t t t w lk at th tlest p bl t m m t
g th best es lt Amputat n f the g gr s
pa t was not n cessary a y f thes caes f r
t n is p ob bly not po s bl m all ca s b t ed
cation f the d d l s ld in foot ca a d th
p ovi on floose dry footg h uld m m th
ccu ence of th c dit n

B JAM GOLDM MD

Bentl y F H and Thomson S Cont l f Infec
ti n in R ent W und B t M J 945 47

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staphyl cocc sp yogene au s The teptoc cu
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per ce t

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infected a d 23 p r c t we e pte f thos tr ted
by operat on a d sulf lam d po d 43 p c nt
e inf cted d 11 p ce nt were pte f those
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e pte when m ned t theb hosp tal f t te
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pletely mo the inf to f m e t w d
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tion Th i c d c f nf c t n w hgh d

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In es A nd Ellis V H B t t l Ca lti T eat
ed with P n s ill n L t l d 945 48 53

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Aboo t l e f 5000 unt f p ll s eful
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u d r f t J E K r k MD

D t n E G G d E nd Wyl W D F t l
Al Embol m D ring Blood Tra f i
L t l d 945 48 53

Th th rs p t cas f f tal a mb lsm
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poc l e J F K r c MD

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Cl k A M Mlln G R d T dd J P Fl a
t n f Ski Grafts w th Hum n Pl m nd
Th mbin La l L d 945 48 40⁹

A method of fi ton f k graft th h ma
plasma d thromb n is d cr b l t is sml
p cpl t that published by Sa o m 1943 but
d f th reg d t th c f the mat n al
d f st ad fu g il ma j pa e l f m th
p t nt o n blood th pl m i bta n d f om
blood of goup AB d nor a d i place f th c ll
tr ct f San a th omb solt p p l by
th meth d f He b t Th thr mb m y b t d
fo c i a e f g t t l e eled

The cp t is prepared by a pply g th
plasma w th ste le camel ha b h Bl d g
whch m y b trubles m q kly t l l d
whe th pl ma i appl d Th ra surf ce f th
sk g f t is th n pa t d th the soluton f
thr mb d th graft p l e d the recip tar a
W th l g grafts t dva tag t t a f w
stch to a ch th m a d i t l p i h
p e appl d

O 6 bu h e be s cc f lly sk n grafted
th th meth d wh chsa t m by c ntr ll g th
i g f m raw r f cesa d by m mzi g the d
f the t tchi g f graft p sit It l m at
th ma n d sad t ges f S no meth d m ly
th tr bl omel borat ryp oced d d b fo
op at nd th ecc ty of thd a g blood
fom th p tie t The m terial d e dil
a a l ble f m th local t nsf n rvc in a
f rm dy f ru Jo e p J M D l b M D

Y g F H m g no C tll g G aft S i
945 7 6 6

The om c n f si n gard g the ably of
a ou types f ca tlag tanspl t T dogs
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r m d fomo r tra plant d at onc t th
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m d f m th t n pla t b t n ttempt w mad
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t f nd th t the p c o b n f p e
h d m had eff ct th rv l f a t g
s ca t l age ft Th 6 p c s f c t l
t lag w m pl ted th bd om al w ll f
d g th ca t l g be g bt nd f mad l g

n ach i tanc l he e grafts v cr then r m c l
f m a j a ir of d gs at inter l In th s av
grafts e e rem ved at t ks thr month six
m ths one ye and ne and one half years

On rem al th tran pl nt e f r mly attached
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j rope t e Th grafts ere measur l and it was
f d that th re as no g i f c t ch ge in i e
All of the ec ed transplants r s t ned nd
xam ned micro c j ically The author believes that
if the p ese ce f n rmal cart lag n us chitecture
s a cr terion then one can state i th ut hest t
that th c transplants rem n v l e

The uthor conclud that from ths p e iment
t app ars that co tal cart lage can be tran j la t l
fr m d g t the subcutan o s t s s es f another
log and r ma v a t l n t s e l cation up t
a d h l f ve Loui T B AR M D

D mm nd R T y l G L nd Edwa d
J T R I m m n izati n t the Rh Fa t
B i M J 945 584

Th auth rs post case f so mmu izati on to
the Rh fact f llo ing repeat d blood t nsfus
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of except lly high t ter in the rum of th
r cip t

Th p t i nt as a marred an f t y s ve
v of age wh h l bee f f r i g f m mel n
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as 3 per c t d the d cell c twas 552 oo
A se f i tra f ons give tho t y
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g p O a w e the d s Bl odgr pig d
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t ansfus

The first 3 tra f s o s g o the first
seco d nds th hosp tal d y a d s of the 6 do
or used w e Rh p iti th Rh goup f th si th
d not kn Th pat t wa d ag osed s
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the th d tra fusio hich n etrope t va c
ta ly due t l g e n mbers f sur vi v g cell of the
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hemoglob Hem lyt c ct ns compl cated th
sev th e ghth nth d t nth tra fus on It
wa b caus of th r ction a d th aggluti s
obs r d i th c ossm tch g t st aft r the t th
tra f ona d th fal f th pat t t imj
fte t y s d y of h p tal zat o that th n ce
ty ff the v st g to was ppa t and t wa
d cl d that the ec p e t s bl o l or nally w
Rh gat e Pot ta ti Rh agglut n m e
d c ver d i th c p e t serum

Aft th se f d gsw red sc ver d i 4 bseq t
tra f si s e giv i volv g th bl d f 7
Rh g t d ors Imp ov m nt f ll d aft

th transfu o sand th re n f b l e r c t
th hemogl b l was sed fom 29 t 7 f r t
Th pati t ralled t mpo ly b t ult m tely h r
c nd t o d te orat d a d sh died o th o e h n
d d a d tw nty-e ghth hosp tal d y

The mp r t nec of pre rvi g p e t r a f i o bl od
sampl s of do o a d cip nts is b o h t o t n
th case as al o th nece ty of a e t a t n the
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h n mult pl blood t nsf s a r c o n t e m p l e d
Rh gr up g fter t s f u n m a y b m l a d g
d rel a b l c o s s m t c h t s t s b f e a c h t a s
fus ho ever um rous hould b p r f m d

ST HEN A ZEMAN M D

M e F M Hep in in th Abdom n A
Sw g 94 5 8

H p i g v e n i t b d m lly t p e n t b
st ct g adh on h u l d b l m t d t h s p
t nts v h o h a h d o m o r e p t o n f
obstruct on e p e a t t a k s f o l l g b d m n l
s u g r y

Th ha ds re h m o r h g i n f c t o and p
sibly del y m wound heal ng The c n t d t n s
a e c e n t a b d o m i n a l s g r y i c o m p l t h e m s t
and poss bly i n t e s t a l e c t i o n The ha d
sh l d b r o g n e d p m p tly w h t h y a p p e
th y a n b h c k d b y blood transf n R d ell
d h m o g l b d t e m n t i o n b l o o d p r u d
i g s and th g n a l p p e n c e of th p t i n t a e
b t t e g u d a p o t h e p i n t r a t m n t h a n a v
k n o w n t e s t f t h e g u l t i n t m A c c d n t a l
o p n n g of th b o l d i t h e d s t n o f a d
h s n s i n o t c t r i n d c a t n f o r h p a d m n i
t t n

In a s m l l e s f e s t h u t h o r a s p l e d
with the complete b s c e f o b t r u c t i o n n the
months and y e r s f l w g t h e of h e p a r n n the
a b d m n b u t t l t h a m o e c l i n c a l r p t s
we must c o n d t h s f h p a r t o p e e t o b
s t r u c t n g d h n s a s p m s b u t n o t y e t
c m p l e t e l y t i l d C H A R B A R M D

F n t z V K N w M t h o d f l l e m t i s g
C l v A 945 5 338

The u t h r e e w t h e b a s c p r i n c i p l s of s o u d
s u g c a l p r o e d u r e a d i n c o n c t i o n w i t h t h c
o n d of t h s o t h e m t c u l o u s n t o l f b l d g
c o n s i d e r s t h c h n i q f h m t a s i n t h e l i g h t f
n e d e l o p m n t s S l i b l e t h m b f i b r i n f o m
a b s b l g a c t t a d a b s o r b a b l p o g e
d s c s e d d t a l a s a g n t s t o p o m o t h e m t
F u t h l a b o r a t o r y d i c a l n e t a t o s of t h e
s b t a c e s a e p g e s s w t h a v i e w t d t m
t h e i f i l d s f g r t e s t f u l n s

J E N J M O E M D

D I n g l a n n i V E a l y n d L t P o s t p e r a t i A m
b u l t n A C m p a r a t i S t u d y f 303 C a
A r h S g 945 5 4

I a t u d y of 3 3 p t i n t t h e a t h o p t
e l d s t t a d t g f e l y a m b u l t

m t h d o f p o t o p e r a t i v e t t m e n t S e v e n c a s e a e
p o t d t d t r a i l O f t h e 3 3 p a t n t s 15 r c e d
c o s e v t t r t m n t w h i l e 153 b c m a m b u l a
t o r y m m d t e l y f t e r p t n

Th heal g f wound c l e l y s c a t e d w i t h
a r l y a m b l i t i o I t h a s b e s h w n t h a t d g s a n d
r a t s h h a a l l w d t b a t i v e o n a f t o p e r a
t n s h n o b r v b l e a n d a r e c a b l e d i f f e r e
a n t h e t l s t g t h f t h e o p e t e d a s
c m p r d i t h n m a l s w h c h a r e p e r m i t t d p
g s t e a s n v e s f m d a y t o d y

The u l m t h d o f t r a t m e n t h b e n t l l
t h p a t t t o d m o e a b o u t d i g t h p a
t l a r p h o f h a l g w h a o u d t h a t h s b e
l d t h u g c a l g u t s e a k s t P l m r y m
b l m a y c u r b t w e e t h t h d a d t h e t h t e t h
p o p t e d y s T h s p r d c o s i d e s t h t h
u l t m f a m b l a t n l s d d t h h c h
u r s h n t h p t e t s t u p f t h e f i r s t m i
e d b y t h b a k g - o f f o f t h t h r m b s h c h
f o r m d b o t v e d y b e f

N t a p t e d t h a t t h e f i t f i g r t y s a
m p o t a t f a t o r t o b o m e i p u m t f r
t t d t p o d e t s i s f l l v d b y e d e m a of t h
t s h h i t n e r a g t h g t h f
n s m s T i c c l i t i m e c s d f m
d f i t e t h t f u a d f i v t t h s d s b y

a h g f m t h s t t g t t h e t d g p o t
C t t m s a o f t h e a s c u l y s t e m b y t h e
c o t a t m u l e c c l t e s t h f l o f b l d
E c h m l e s a h r t n d a c t l k s b t t o

s e n d t h e f l o f b l d I t h t
t h s a p d p o s t i n f e c t of t h e p a t r y
t t n d p h l b t s e d o e l l t o o u d t h g
t l c o m p l c a t n f t s s T h m e t a b o l i s m
g a t l y s l o e d n b y c t i t y T h t n d g
p a t l v e s s b d p h r m t i c p t h u s
p r m i t s g t e p o f t h l u g s

W i t h a p l d e t s t b e d t h e t e z t
d p u g t o m e t a l t t u d f l l b n g s
m a t d a n d t h i s n l e r p d f a b
n o r m a l b y f u n c t

T h e t m t f q t l y m t d c o n t d c
t t o e r l y a m b l i t a () p l m n a y m b o l
a d () t h d a g r e s u l t g f r m c l u s o f t h e
w d t h a s o b a b l m a t e l T h a u t h o n t
t h t a m g t h o o s s h i t h p t t
b m m b u l a t r y t l y t h a v e b e e r p t e d
t d a t e b t s c s (5 p e t) f u l m n r y
e m b o l i s m S n m a y f t h e o o o a g a l
g t w a s d f o r l e i t h r p r t e d i l l e c t
t h e e s m l t l t b f a e d w i t h t h t y p f
s t m t r i a l

E l y m b l t m d p o b l s a v i g f a t
l a s t \$ 464.00 h p t l p s e s t t h p t e t s i
t h p s t s r i e I f t h e c m p n d e i n g s y l d d
b y e a l y t r n t w k a e d d d t t h f i g
t h s u m t a l h u l d b t t l g A s h o t e n d
p d f h p t l t i o l p m t t d q c k
t v e r f p a t t

I t h r i f c a s p t d t h p t t s e r
d d e d t 3 g p s () p t n t h a g r p

pendectomy o ly (2) patient hav g a sug cal oper t n the lo ver port on of the abdome with or with ut ppendectomy or w th or w th ut v ginal repa r and (3) patients ha g a cholecystectomy Th age d tributions th 3 group and number f p t i t n each age deale e sim lar
I c clu on the author notes that early ambula t do ot i crease the fr quency of compl ca ti no danger the p t e n s has been prov d by cas r po ts and e peri ce II ever ne ther d es e ly amb lation el minat all of the compl ca to s has b claim d by m ny advocats of ths meth d f po toperative t eam t
H RBE F TH TOV MD

Davis H H and Hansen T M In tigation f th G u e and P e e n t i o n f Gas Pain f l l o w l g Ab d m i n a l O p r a t i o n S g y 945 7 49

P t s per t i ly after abdom nal u gery there is defin t dec ea e in intestinal m t l t y D gs such p tes phy ost gm and p ost gmine h h stim l t th mall intest n have a p p o s i t f l t o the c l P tressin inhib ts small bo el acti v ty but tim l t the colon Th acc mulated g s n th n t i e a s d b y the wallowing of a esp cially duri g the induct on pha e f an the rath r than any put efact proce Th autho m asu d th amount of sw ll d a i d ng th i d c t n pha e of anesthe i d fo nd it to y f m 600 to 2 50 cc

Sw ll w d a r and the attendant d s c m f o r t of gas pains can b p r v n t e d by the pre j u a n t r o d t n f a l v n t b e attached to W g t n u c t o n O c t h a pass s n t the sm l l t l t h l a t t r m th d i s n l g e f f t

As a s l t f t h p e p t a c t on technique th p r c n t a g e f p a t s w t h g s has dropp e l f o m 81 to 4 p r n t a d t h e g m b e r f d a y th gas pains d i p e d f m 4 t 95 per c n t F the th n e c e s t y f t h f p s t g m was m k e d l y r e d u c d a l s o t h t o f n m n d c t a l tubes B j x v G P s r M D

Pi mi t D B Th M h n i m d M n g m n t f S g l c a l Shock J A M t 945 7 09

S g c a l s h k s the t m comm nly used to de n t th c t e m b a r r a s s m e n t f a i l u r e o f t l c u l a t w h b a r e s s a l t f b o d l y i n j r y w h e t h r p d c e d i t n t n a l l y c o m b t n d i n s g a l p e t o n s o t e t n l l y c d n t o f l l f

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c e t l y p r o n o u n c e d a d p l o n g e d the b l o d p r e s s u r e d o p s t o a l o v l l a o u d e v e l o p s the t i s u e s a e d a m a g e d a d b o d y f u n c t o n i s i m p a r e d o n the v h o l e a n d a c o n t n a t i o n o f s u c h a s t a t u r u l t s i n c m p l e t e f a i l u r e o f t h c r e u l t o n a n d d e a t h

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M L h l i n J A Th I n t r a n o U s o f N o c i n a S B t i t u t f M o r p h i n i n P o t p e r a t i C C d M A J 945 5 383

N o c a m h s b e a l m i s t e r e d i n t a v e n u l y i n t h e c t e m e n t f n t u u m a n d f o r t h p u r t u f j a u n d i c e R t l y p r o c a e h a s b n g n n t v n o u s l y f r t h g i c a l t r a t m e t o f b r n s I t h a b e e n s h o w t h a t p r o c a e i s d t o x i f e d a n d h y d o l y d e d o w n t p r a m i n o b e z o i c a d a d d i t h y l m i n o e t h a l w h c h a r e e c r e t d b y the k i d y i t h n t n o t w e l v h o u s

P h a m c o l g a l l y p r o c a e h a s a m a k d a f f i n i t y f o r e r v t i s s u e a n d c t s a s c o n v u l s a t d t m u l a n t o f t h c e r b r u m S y s t m i c r e a c t o t o p c e e a n d c a n b p e d e t d b y m e a o f a n t r a d m l w h a l o f p o c a e T o x c r e a c t i s d i n g t h i t r a e o u s a d m n s t a t i o n o f t h d r u g m v b e e t h o f the c o n v u l n t y p e i n the c e n t a l v u s s y s t e m w h c a n b c n t o l l e d b y s d m l u m l o r o f t h r e s p r a t r y c i r c u l t o r y t y p e n t o l l e d b y a d e n a l n

In the authors series of postoperative cases involving a general intra-abdominal infection, the results were as follows: 1. The use of morphine in the management of pain was found to be of great value. 2. The use of the latter drug in the management of pain was found to be of great value. 3. The use of the latter drug in the management of pain was found to be of great value.

B G P SHAW MD

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Peters L W P Phylaxi f Wo nd Infection Studt with P rt cul R f nc t S p nd Irrig ti n t h S g 945 5 77

Because the results of the present study are of great interest, the authors have conducted a series of experiments on the use of antiseptics in the treatment of wounds and infections. The results of these experiments are as follows: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

The following results were obtained: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 4. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

Results of the present study are as follows: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 4. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

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the results of the present study are as follows: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

The best results were obtained by the use of the following antiseptics: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

STEPHEN A ZIM MD

Hgg J F Wack G B R a d N i R W Nut l i off In S late i l fected W nd In l ing B n E i V J 945 437

The results of the present study are as follows: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 4. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

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When applied to the wound, the antiseptic was found to be of great value. The results of the present study are as follows: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

The following results were obtained: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 3. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 4. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

In the present study, the use of antiseptics in the treatment of wounds and infections was found to be of great value. The results of the present study are as follows: 1. The use of antiseptics in the treatment of wounds and infections was found to be of great value. 2. The use of antiseptics in the treatment of wounds and infections was found to be of great value.

STEPHEN A ZIM MD

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solution are injected. The solution blocks the midline inferior and still the ganglion by its descent in front of the aponurosis. It diffuses down and in the soft cellular tissue. If this fails to produce a Horner's syndrome, a second injection is made directed to the base of the seventh cervical transverse process.

The various therapeutic indications for the procedure are described. The various phases of the study are given in a considerable detail.

ANDERSON VER. CCGH. MD

Whitaker, R. J. and Fish, A. J. Clinical Observation on the Use of Cushing's Anesthetic in the Larynx. 1945, 6, 24.

Cure of laryngeal and tracheal stenosis by the method of intra-abdominal surgical procedure. However, it is a serious and conservative as a method of improvement. It shows peculiarities of the combined cyclopropane as very little curative effect results in a poor patient. Fever, complete, occurs when small doses of the drug are used and is fatal. It is limited to the first and second stages.

If the presence of deep ether anesthesia is maintained, even mild doses of curative cause severe cutaneous reactions. Therefore, it is necessary to exercise considerable caution in the use of the ether.

When sufficient curative agents are present, the muscle of the larynx and the foreign material in the lungs may cause sedation and precautions should be taken. The use of the combined cyclopropane and paralysation of the muscles of the respiratory system and the respiratory system equally occur with the drug. The curative effect is due to hypoxia and the accumulation of the respiratory system in the lungs.

Anesthesia was obtained with curative alone. However, large doses would produce complete relaxation of the skeletal muscles and consciousness. A detailed report of the cases was made in which the patient was treated by the use of the drug. The patient was treated by the use of the drug. The patient was treated by the use of the drug.

The treatment of the drug is anesthesiology considered a step forward in the practice of the study, necessary to the study of the drug.

MAR. K. R. MD

Martin, S. J. and Schwab, J. M. Blast Injury to the Thorax. The American Journal of Surgery. 1945, 6, 3.

The subject of blast injury is a most important and timely study. The author's estimate of the blast injury to the body is a study of the blast injury to the body. The author's estimate of the blast injury to the body is a study of the blast injury to the body.

lic concussive injuries of the clinical evaluation of the symptoms and signs of the proposed anesthetic management of such cases undergoing operation.

Following a blast the sudden release of pressure compresses the immediately surrounding gas to form the pressure component which may have a pressure as high as 200 atm. spheres behind the shock wave develops a secondary compressive wave of rarefaction or the tension component which may have a pressure as high as 5 lb. per square inch.

The mechanism of blast injury is most widely accepted principles that the lesions follow the traumatic effect of the blast produces a sudden elevation of the atmospheric pressure which hinders the expansion of the air through the chest and forcibly compresses the thoracic cage and the abdomen. As a result the pulmonary structures are ruptured and hemorrhage occurs from the subcutaneous vessels.

Experimental work on animals has shown that fatal effects of pulmonary blast occur only in a relatively near to the explosion. Fall of the blood pressure occurs proportionately to the intensity of the pressure wave. The initial fall is the result of traumatic shock while the sustained fall is the result of an increase in the pulmonary blood pressure. Immediate death is due to shock, internal injury and occlusion of the arteries by blood clot. Delayed death is caused by pulmonary edema and occurs usually by intraperitoneal hemorrhage. Rupture of the eardrum often causes abdominal lesions are found in about 40 percent of the cases.

The symptoms most commonly observed are shock, the distress, dyspnea, chest and abdominal pain, cough, expectoration, hemoptysis and leg and neck tenderness. Pulmonary bleed, gross, is a forerunner of the hours and unilateral complication. The symptoms usually subside within days. The most frequently noted symptoms referable to the central nervous system are temporary unconsciousness, later intense headache, dizziness and lethargy. Sudden death is due to hypotensive changes in the cerebral circulation or to sudden compression of the thoracic cage. The characteristic pathologic consists of bilateral pulmonary hemorrhages. Microscopically, gestation of the alveolar capillaries is most frequently found. The immediate prognosis depends upon the extent of the injuries. If the central nervous system extends to the level of death is usually immediate. Death may be due to shock, pharyngeal or tracheal secondary invasion of vital organs.

The use of bomb shelter will never be possible having things of a cotton or plastic appearance as a physical means. In the event of an air raid, the individual should be able to quickly and attempt to protect the most vulnerable parts of the body such as the chest and abdomen.

Immediate therapeutics include the administration of shock and hypoxia by plasma or whole blood and oxygen. Adequate morphine, heat and the Trendelenburg position are recommended for dyspnea.

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M v K MD

SURGICAL INSTRUMENTS AND APPARATUS

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E C Ro rrs MD

PHYSICOCHEMICAL METHODS IN SURGERY

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low lying condit o s may e n produce cl nical symp
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The abs l t d gn st c f e t re the d monstr
tion of the tube cl ba ll u in the putum When a
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The ro ntg nologi t s d agnosi f the chest oent
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Adenoca c noma of the lung el ti elys l wgrow
ng and n the early t ges may p oduce ery l ht
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n ct e r mldly act pulmonary tub culos s
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which is appar ntly resp nsi e to e rly rad cal
surg ry Jos FR K NAR MD

B hr n C F Som Roentg n logical Con idera
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P m d ability a d ab ormal s nsati n in the
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rhe matice e or b rsts Cl ibication in th
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usually seve e pai and d ability

Patients with negat e should r roentgeno ams
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p s bility A common findi g s thun g of the
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Pa n s caused by pressure on the nerve root the
eg n of the interve tebral foramen Arth it c
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The b st th py for sho ld r pa n s is the conv n
tional ma s g m nual tracti n a d ma p lati n
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patients with ruc l rthrits hav be n f rable
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by the blood pressure is f quently seen th s cau d
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The author us s fr m 75 to 100 ntg s f o
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res stant then x ray therapy sho ld be d cont rued
Irradiati n therapy has als been efficac us n the
tr atm t of herpes zoster MA RICE D S CH MD

K s ba h H H and Do lan C P Roe tg
th appy f H m ngi m f th L rynx in i
fants J P 3 d t L 945 6 374

Hem n i ma of the larynx in infants is a v ry re
co iti n

Th auth rs epo t 2 cases n which r entg a
therapy produced very sat sfactory re ults The i
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Th a thors al coll ted o cas f om the lt
at re Th a tabula ly p s nted by ons d nng
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e d result and s ciated path logical ond tions

The follow ng facts ar establishd

Hema g ma f the laryn n nf nts s cong t l
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Th ba l s f B c k rco d the ep th l
d ell t b l w th cas l g a t c l l of the



Fig. Left: Soft thickened lymph node (April 5, 1944). Right: Ring-shaped lymph node (July 7, 1944).

Lymphatic system in the absence of cancer. Very rarely there is some central necrosis. Because of the character of the pathological findings, it is usually the disease as hypoplastic or necrotic tube.

Clinically, the condition most frequently occurs in the mediastinal lymph node and the pulmonary vessels, although practically every organ of the body may be involved. In the most common form, the histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis. The histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis. The histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis.

The clinical picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis. The histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis.

It must be taken into account that the presence of the lymphatic system is not always a sign of cancer. The histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis. The histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis.

During the past two years, the authors have treated 4 cases of B-cell sarcoma in the Department of Radiology. The State of Wisconsin (Nebraska) Hospital. Attention was paid to the histological picture. The histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis. The histological picture is characterized by the presence of the lymphatic system and without any further changes in the structure. In such a case, the examination of the histological picture shows a prominent role in the diagnosis.

Eight of the cases treated have been followed up. In 6 of the cases, the histological picture showed improvement within a few months after the pyrexia had subsided. In 1 case, the histological picture showed improvement within a few months after the pyrexia had subsided. In 1 case, the histological picture showed improvement within a few months after the pyrexia had subsided.

The 8 cases considered previously present a number of symptoms and the histological picture showed improvement within a few months after the pyrexia had subsided. In 1 case, the histological picture showed improvement within a few months after the pyrexia had subsided.

The preliminary conclusions are that the results are favorable in the majority of cases.

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T l f r M D

MISCELLANEOUS

Packard C a d E n F M Comparis n f
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Dos M su em nt R d l g y 945 44 37

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tion of the plant directly through the main
medium clinically

The present technique describes a
lithographic process for the production of
highly accurate illustrations

As the lithographic process is still
developing, the present still
perpetuates the same mistakes as the
past in the localisation of foreign bodies. In
order to minimise magnification and distortion, the
film focus distance should be 36 cm. The
exposure should be short, possible under the
circumstances to be taken from the gamma
rays. In some cases, black and white reproduction
is required, for example, for the measurement of submillimetric

In order to obtain the actual dimension of an
implant from the lithographic measurement, it
is desirable to use a known field position by
a guide. The authors describe four methods

The geometric method, which is the most
difficult, is based on the fact that the
film is a flat surface and the implant is a
cylinder.

The indirect method, in which the needles
are used as gauges, is the simplest, but only one
film to be placed in the plane of the
implant will give a true magnification. If the
recording film is of the same length as the
implant, the result is true.

The geometric method, in which a bracket
is used to measure the distance between the
implant and the film, is the most accurate.

to be as nearly as possible at the same distance
from the implant as the film.

The indirect method is the most accurate, but
it is also the most difficult.

The first method is rather inaccurate and the
result is seldom as good as the second. The third
method is especially valuable in cases of implant
location, and is used when the sources are high and/or
of unknown length. The fourth method has most fre-
quent application in regular single plane implan-
tation.

The examples chosen by the authors for the illus-
tration of various clinical situations include (1)
single plane single needles, (2) single plane single
needles, (3) two plane single needles and (4)
cylindrical volumes, as for example the implant
in the skull.

The conclusion is drawn that the lithographic
method is a valuable method of measurement, and
that the authors have described a method of doing
calculations. These may be summarised as follows:
The measurements and distances are the ability to
visualise and correct faults in the position of the im-
plants. If the sources of the implants are at
different points, some of them may be removed
by the use of a vice. Thus, as a whole, the homogeneity
of the irradiation is used. The length of the
implants is not the fact that the permanent record
is obtained of every implant position and in the
basis of established clinical cases, the faults of
accuracy in technique may be corrected. In the
main, it is possible to formulate a method of
rule, if clinically certain type of treatment appears
more desirable.

T. L. E. M. D.

MISCELLANEOUS

DUCTLESS GLANDS

Cu t G M and F rman M B Blood Iodine
Stude An Analys f th Bl od Iodin in
Thyroid D sea e l h S g 915 5

The auth rs tat that the p in spal o sid r t n
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phy i l g c l and patholog cal states The es ent al
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i f ne b ar t the thyr oid hormo unkno vn

Th d t m nat n of bl od i dne valu s by the
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of hyperthy dism f r the simulat g co d tions
in hich the basal metabol rat s al o l t d
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o d sm in wh ch the basal metabol c rate may be
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tal n at stated intervals off r a means whereby p e
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h p thy oidism can b pr d ct d The k el of the
blo i dne may leu i an inde f d t m ng
the cor ctam unt f thy od tssu torm e The
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-7 p e cnt i d f e nonto coll d g t r

The a e ge blo d od n n 79 p tients w th
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Th a g blo d iodi e m g pate t w th r
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In 3 pati nts th l n c thyr id t the a e ge
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Her r F Tuck r J M D

Viets H R Myasthenia C is J Am M A
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The pes nt t cl att mpts to val ate th
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g e a sum ry f the investigati ns und r taken
the res l found and a vie f th mo t impo t nt
l t e tu A s p a t utpat nt cl c w s est b
l h d i 935 nd bout 60 ca es a e b e n foll d
c n tantly

Nostigmin was first resorted to in March 1935 and has continued to be the principal drug used in the treatment of myasthenia gravis. Nostigmine is a useful anticholinergic means of diagnosis—the study of the salivary gland before and after neostigmine injection is the most reliable diagnostic.

In treatment the average intake of 45 ambulatory patients ending in 1943 and 1944 was 9 tablets of neostigmine bromide (15 mgm each) spaced during the twenty-four hours or a total of 63.5 mgm. However, some patients maintained a minimal amount of dosage in a few cases as little as 5 mgm daily in doses which were taken by mouth sufficient to relieve mild symptoms. Nevertheless, general weakness or more specific symptoms such as ptosis, diplopia, dysphagia usually required larger amounts. The highest dosage was 25 tablets a day for a patient who has been maintained in this intake for number of years. A report of this case is given.

Special characteristics noted in that used by Schab and Skogland suggest the possibility of recording the symptoms and assists the physician in the outpatient department in determining the amount of dosing. The future developments of this drug. However, in the patient is more reliable than the average in an ambulatory clinic. Neostigmine is given in the form of neostigmine methylsulfate by subcutaneous intramuscular injection—this preparation may also be used intravenously and given in the dose of 1/2 to 1 mgm administered in 5 to 10 minutes. The patient must be strictly watched and administered the dosage to him in an emergency such as apnoea, myasthenic crisis or the development of the apnoea and chest muscles. Under ordinary circumstances 5 mgm of neostigmine methylsulfate equal 5 mgm of neostigmine bromide taken by mouth. Atropine is usually added to prevent the muscarinic effects on the smooth muscles and ordinarily 6 mgm is sufficient for this purpose.

Other drugs used in myasthenia gravis are the phosphates of potassium, chlorides and guanine hydrochloride. However, none of these has been found to produce any effect on the efficiency of neostigmine and due to the various shortcomings of the patients at present can be used.

Among the 5 patients by treatment with thymectomy the last four years there were 4 patients (66 per cent). Thymectomy was found in 4 hypoplasia of the thymus gland and the thymic gland appeared to be normal; the remaining 8 patients. Of the cases recorded at the present time, a complete remission, moderate to complete remission, proved 3, a moderate to complete remission, slightly improved 3, have been produced to completely be eliminated. The cause for the thymic photograft of the thymic glands and the complete specimen appended and how that the drug of improvement to be attributed to the patient's treatment. The history of the patient's improvement is a complete remission of the thymic gland. A thoracotomy is suggested by me to

advocate thymectomy in every case of myasthenia gravis. Particularly patients of the older age groups (over fifty years of age) should not in most instances be treated by thymectomy.

At the present time a still in the experimental stage with slight but definite indications however that there is a relationship between the thymus and myasthenia gravis.

JOHN W. BRENNAN, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Hilander A. R. and Santos P. B. Lymphoid hyperplasia of the nasopharynx. A Study of 131 Autopsy Specimens. *Arch. Otol. Rhinol. Laryng.* 94: 4-9.

The distribution of lymphoid tissue in Waldeyer's ring was studied in 131 autopsy specimens. The commonly accepted concept that development and involutional changes in the lymphoid tissue of the Waldeyer's ring follow a caudal sequence was not entirely borne out. The nasopharyngeal and tubal tonsils developed a least involutional sequence during childhood up to the age of twenty years and more. Of the latter cases, 3 showed hypoplasia of the nasopharyngeal tonsil, the tubal tonsil showing more constant involutional changes later years. Thymic involution is raised as a hypothesis of lymphoid hyperplasia as a factor in the pathogenesis of the older persons. No correlation was found between the stage of development of the pharyngeal tonsil and other pathological processes in the body.

JOHN R. LEVINSKY, M.D.

Rittino A. and Willson K. Ossification of the iliac crest and iliac crest tumors of the ilium. *Bull. A. R. Soc. of the Literature.* 4: 5-8, 943-5-84.

Rittino and Willson reviewed the literature pertaining to aggregation of the tissues of the breast. Colicivilyth growths are characterized by the presence of bone cartilage, fibrous tissue and pleomorphic cells and aggregated growths of the elements are found in combination. They have been reported as chondrosarcoma, chondroma, osteosarcoma, osteoma, giant cell sarcoma, myeloid sarcoma, myeloid tumors, osteoclastoma and teratomas.

Available cases were analyzed which included 7 enchondromas, 1 chondrosarcoma, 8 osteochondromas, 1 chondrosarcoma, 5 osteosarcomas, 5 osteomas, 1 giant cell sarcoma, 5 mixed tumors and 10 ossifying chondrosarcomas. The cell tumors associated with chondroma. These series were tabulated during the year of their report. The patient to set of the tumor symptoms, the tumor was not differentiated by histology.

All the tumors were considered essentially malignant, much as no matter the histological features. The treatment employed (excision or radical mastectomy) must usually occur. It is found that a long standing fibroadenoma was many cases the present growth from which such tumors

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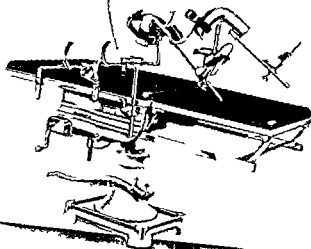
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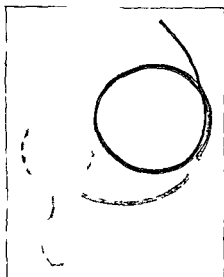
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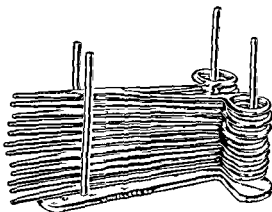
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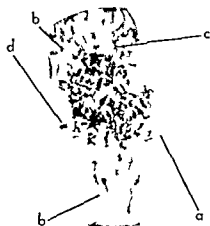


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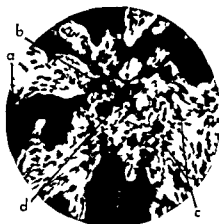
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SURGERY

GYNECOLOGY AND OBSTETRICS

An International Magazine, Published Monthly

V 18 81

NOVEMBER 1945

NUM 5

OSTEOID OSTEOMA

With Case Reports

J F HAMILTON M D F A C P Memphis Tenn e

OSTEOID osteoma is a benign bone lesion so named by Jaffe (2) in 1935. He believes it to be a definite entity and defined it as follows:

The lesion is a benign osteogenic tumor of slow growth. The original phase of its evolution in a given site seems to be the proliferation of the local bone forming mesenchyme and particularly of its osteoblasts. Indeed at an early stage the tumor may consist largely of a vascular mesenchymal substratum closely packed with osteoblasts although showing also a scattering of osteoclasts. He (3) made a further contribution to the subject in 1936. In a later study of this condition in 33 patients by Jaffe and Lichtenstein (4) they saw no reason for changing Jaffe's original conception of the lesion.

Since the available literature on this subject is small it is felt that a further discussion of the disease with a report of an additional 5 patients would be in order. Furthermore it is believed that the condition is more prevalent and widespread than the literature indicates.

As stated it was in 1935 that Jaffe described in detail for the first time this benign bone lesion and reported 5 cases. All of these patients had come to his attention in the year

1933. Because of the similarity in symptomatology physical and roentgenographic findings and the pathologic pattern he gave the lesion the name osteoid osteoma.

In this same article Jaffe refers to a paper entitled Sclerosing Osteomyelitis of Carpal Scaphoid 1909 by Hitzrot with roentgenograms similar to his Cases 1 and 3 but with indefinite microscopic data. Again he refers to 2 case reports by Bergstrand 1930 under the heading of a peculiar and probably not hitherto described osteoblastic disease in long bones of hands and feet. Jaffe feels that these were probably osteoid osteomas. By 1940 Jaffe and Lichtenstein had studied material from 33 patients with osteoid osteoma. Kleinberg (5) reported a case of osteoid osteoma in 1941. Five more cases were reported by him (6) in 1943. Mallory reported 1 case in 1941. Horwitz reported 1 case in 1941. Thoma referred to the condition in 1938 and Lewis recently reported 11 cases in 1 of which there was no microscopic confirmation which we hold to be imperative before a final diagnosis is made. Without 5 cases a total of 58 patients with osteoid osteoma have been studied.

ETIOLOGY

The etiology of the disease is unknown. Whether trauma is a factor in precipitating the condition has not been confirmed.

CLINICAL DATA

Age The lesion is most commonly seen in the second and third decades of life however it has been reported in both younger and older individual. Our youngest patient was 16 (Case 5) the oldest 40 years of age (Case 4).

Sex In the 33 patients studied by Jaffe and Lichtenstein there were 24 males and 11 females. In our series of 5 cases there are 4 males and 1 female.

Symptomatology Pain is the dominant presenting complaint in all patients. Its intensity varies being relatively mild to intense and even preventing sleep in some patients. It may be intermittent in the early stages gradually becoming more constant until it finally forces the patient to seek medical advice. The pain has usually been present for 3 or more months when the patient is first seen by his physician. The pain is most often localized to a very small area frequently not over 1 centimeter in diameter directly over the site of the pathology. Occasionally it is referred (Cases 1, 4 and 5). The pain and tenderness may antedate any other clinical or even roentgenographic evidence of the disease by several weeks or even months. The fact that the patient has local pain with few physical findings to support it and even negative roentgenograms in some cases is one of the most striking features of the disease.

Physical findings Exquisite finger point tenderness over a small area rarely more than centimeter in diameter is almost a constant finding. This one finding should immediately arouse suspicion in an astute observer that he may be dealing with a bone lesion of the variety osteoid osteoma. The degree to which this physical sign is noted will of course vary according to whether the lesion is near to or more remotely placed from the surface of the body.

Swelling of the adjacent overlying soft tissue is present occasionally. This is due to congestion and edema of the adjacent periosteum (Cases 2 and 3). Local fever is very rare and redness of the skin is seldom noted. Occasionally the patient will complain of a knot at the site of the lesion which is due to a deposit of sclerotic reactive new bone beneath the periosteum. This is especially prone

to occur if the lesion is in the shaft cortex of a long bone and may easily obscure the real pathology unless overexposed roentgenograms are taken at different angles to bring out the nidus as suggested by Pomeranz and quoted by Jaffe and Lichtenstein. Whether the patient will have a lump or dysfunction of a joint depends of course upon the location of the lesion.

Two of our patients (Cases 3 and 4) gave a history of direct trauma 7 months and 24 months respectively before admission to the Clinic.

Skeletal sites Osteoid osteomas have been found in the following bones namely tibia, fibula, femur, vertebra, humerus, ulna, skull, facial bone, phalanges (manual and pedal), patella, calcaneus, talus, tarsal, navicular and ilium. The bones involved in our 5 cases were as follows: second cervical vertebra (1), humerus (1), tibia (2) and talus (1).

Roentgenographic findings The x-ray film of the affected region will almost always reveal a bone lesion responsible for the symptoms and signs presented by the patient. Occasionally the first picture may be negative or the lesion may be so minute that it cannot be seen even after as long as 3 months from the onset of pain as in the case of 1 of our patients (Case 1). Therefore the age and location of the lesion will determine to some degree its roentgenographic characteristics. A typical picture of an osteoid osteoma (Case 3) reveals an oval to round area from a few millimeters to 1 or 2 centimeters in its greatest diameter the center of which presents small areas of rarefaction and condensation surrounding this a narrow zone of condensation and in turn just outside of this a zone of rarefaction. The surrounding parent bone is as a rule sclerosed for a variable depth. Varying degrees of this roentgenographic description will be noted for example (a) our Case 2 presented no bone defect in the first x-ray picture but weeks later a very small nidus showed up in the external condyle of the humerus; example (b) in our Case 4 a small lesion incorporated in a very dense thickened sclerosed tibia was obscured by the thick sclerotic bone. This may be easily overlooked in a routine roentgenogram. In the latter

case one may have to make several overexposed films at different angles before the lesion which may not be over 3 or 4 millimeters in size can be seen.

Osteoid osteoma may occur in the cortex just beneath the periosteum (Case 1) intracortically (Case 4) or in spongy bone (Case 2). Evidence thus far supports the theory that a much greater defensive response to the lesion is made in the form of marked thickening and condensation of the cortex subperiosteally and intramedullarily if the lesion is situated intracortically in the shaft of a long bone than if it is located in cancellous bone. The reason for this is purely theoretical and based on conjecture. We have no evidence that this benign bone lesion has ever invaded or broken through the periosteum but if incompletely removed surgically it will continue to grow and produce pain as it did before operation. Osteoid osteoma has never been known to metastasize.

Laboratory findings. All laboratory tests in our cases including Wassermann blood counts, urinalyses and bacteriologic cultures were nonrevealing as to the nature of the lesions. Cultures were made in all of our patients (Cases 1 and 3).

PATHOLOGY

If the pathologic lesion is near or on the surface of cortical bone the periosteum will likely be thickened, edematous and show capillary engorgement (Case 1). The involved portion of the cortex will all be hemorrhagic in appearance. If on the other hand the nidus is within the dense shaft cortex one may find much sclerotic new bone having been laid down beneath the periosteum as well as on the medullary side of the bone. The gross appearance of a typical osteoid osteoma usually consists of blood stained, gritty, friable cancellous like bone. The cut surface shows reddish brown flecks mixed with pearl gray osteoid. The reddish brown flecks represent the calcified osteoid quite similar to callus and the pearl gray the osteoid.

Microscopically a typical picture of an osteoid osteoma (Case 3) consists of much vascular richly cellular embryonal type of osteogenic connective tissue representing all elements necessary in the development of membranous bone from the most primitive myxomatous connective tissue cell to fibrous connective tissue cell and finally to the osteoblast in which are islands and trabeculae of osteoid, calcified osteoid and atypical ossified bone surrounded by large numbers of osteoblasts and not a few osteoclasts. At most any place in the vascular cellular stroma one may see osteoblasts and an occasional osteoclast. Osteoclasts if adjacent to calcifying osteoid or atypical bone usually lie in little depressions called Howship's bays.

The foregoing is a description of the center of the lesion but as the periphery is approached there is more of the osteoid and calcified osteoid which is responsible for the sclerotic outer zone seen in the roentgenogram. Just outside of this zone and separating it from the more or less sclerotic parent bone the primitive vascular mesenchymal type of connective tissue predominates with its ramifications extending into and filling the already enlarged adjacent interstices of the perifocal sclerosed bone. This tissue may reveal osteoblasts but no osteoid or calcified osteoid and is believed to be the precursor to the formation of the pathologic lesion.

DIAGNOSIS

The diagnosis is relatively easily made provided the pathologic process has developed to the point where there is roentgenographic evidence to support the clinical findings and the physician is aware of the possibility of the presence of an osteoid osteoma and has been schooled in the symptomatology, physical findings and roentgenographic evidence produced by the pathologic process. In summarizing the following are the important features which are of aid in making the diagnosis:

1. Pain of a dull aching character most annoying at night.

2. Pain localized for the most part to a small area but which may be referred (Cases 1, 4 and 5).



I) ft C N 4 890 A t post oe tg m N mbe 930
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m d
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l a n o c l a s s f i e a s a n s t i d t e o m a
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f l Th p i n p e n d b e f o o p a t i n s b s d d
d h e w a l l e l t e u m e k a s g r c e r y
c l e r k 5 w e e k s f t o p t i o H a s n e x t s e e n o
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h d c h g f o m the A r m y b e c e f u r e n c e f
p n n d o r e a b o u t the o l d l e a f t d i l l i n g
l t r o u e r c e E m t a t t h i t m
c a l d l i g h t t i n e s o the o l d s r i t h
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t h e r g e r a l c l c h i n g a n d l i g h t l l i n g i n
t h e r g h t l g b o t h l d n d a c h g d n t h
l g T h i c a m o n f t h e s n h f t f h a l f a n
h u r O t h e r e t h p h y i c l a m a t n n d
t g g r p h c l i m s (Fg 4) e n g t e S m
d b t a o s e a t t h e d g e o f p n t h p a t e n t h a d
a n l t s e E x p l t o f t h l e g v t h u g h t
n j t f i e d a t t h a t t i m e W h a b e e n n a b l t
L t a l a t r f o l l u p n t h c a e
C A S E G R N 5 4 7 4 4 w h i t e m a l e g d 3 4
y a r s f r s t i n t h C l n N m b 8
9 4 w t h p i n n d e n t h r i g h t l b f 3
m o n t h d r t i o n E c i s u c h a p l y g t e n
g g r a t d t h e s y m p t m H a a a k n e d b t h



F 5 l ft C N 54744 A t p t t
g or m N mb 8 94 f ght lb w d g

F 6 C se N 4744 Ant pot n oe t o-
g m M h 9 94 ks ft fil Fg
d l m ll l d th d d t
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f th h ru d t d by

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h g p t q i te tend s d bl nd

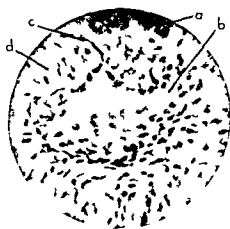


Fig 7 Case N 4744 Ph t m: gr ph X35
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f t blasts d th llul ost g nnect
ts d

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humeru b tve the ep c dyle nd l c a f x
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t i elb or m l b t n tem f m t
p n asp c p t t d at th t oft d Roe t
g nogram f th ht lb s gat (Fg 5)
Phy cal therapy t the lb f p blets
m t co fect th t l m s f t n
ou c e l d H n t
Mar h 9 194 (4 m th lat) th th m
v mpt m and ph c l f d ng th 6 t
am ton

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led mall l a f l ton d
lv f d z mea g 6 by 7 m l m t r s th
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m l t th rt cul s fa

Th p f i e as pl ed Ap l 4 94
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C l th ce t f the sm th d t p f
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d Th m c p e s c t led

a c l h ghly c ll la tru tu h h th
ch t d d c l c f d teo d fo m g k l f
latt c k (Fg f t p ce) Ther n m
r st bl t b d th t b cul fo teo d
d cal f d t d as ll the c l l f
t s O t l t f k c mm Th ll
la s f t c mpo d f mby l p
os t p f t ge t c f b t et
n h h n m o st bl at f af
t oc t A f lymph cytes a d pla m ll
r sen th fit lo As n pract call all
f th ca th c ll la o c t s e m d t
sepr te f the most p t th m ntr ll
l c t ed t d d calc d d st d mat l f m
th d ng p e t b

Th p t t p t p e t cours as t f l
Th p d app d b t ther lght ll g
d slght l m itat of m t th elb h h
n sl st b t 30 d y ft p rat

CASE 3 F M N 6358 ht f mal g d 4
ye adm t t d t th cl July 943
ith p f l ll ght kl c D e mb
94 h n p c f f h d st k h r th
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a d t th t me Sh h d t t p p d ll g
lth gh th m h kl l th m p n a d
ell g h had th f t a d a k le
O m nat th a f d m k d ell g
nd p t t d m f th a kl a d f t M k d
t d es llo th kl but esp call th
t f c Th l cal f but th
k n r th nkl a d M t th kl n f
J ts f th foot wa l m t ed b m k d p
Alat l ntg gam af th kl (Fg 8)
led pecul l l n the p r por



F 8



Fig 8b



Fig 8



Fig 8d

9by9mll trs th sp p t fth n k fth
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 t t d l t whol th m g l t d th
 t m ded by a th f ad l y b
 L t l oe tg gram 8 m th l t M ch 3 944 f
 ght kl h th l t h g n t e 4 by 4
 mll m t S g l spe m th mll m f p
 foe l bo h g r y n g d o r f t n s t y f x p
 oe tg g ph lly d P t p e t tg gram
 Ap l 4 944 h th d t h b m d
 l g f d th k fth t l
 F 9 C 3 N 6 3 8 Ph t m og ph (X300)
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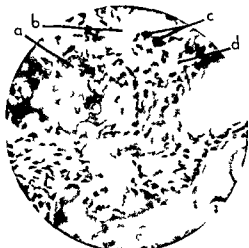


Fig 9

Fig 8 C 3 N 6 3 8 L t l oe tg g m
 J ly 943 f r i g h t k l h p l l l

t n fth k fth t l ith b ut n th dof t
 pot d g b ethes f c fth b e ltm d
 9by9mll mtrs Th t d l t d
 t p ph y m cl t c (5 mll mtrs
 th k) J t t de fth cl t c n a
 f d h l S c the l n not c g d

an t do to ma th p t t a ftt d th
 kl rset and h sall d to t rn hom f
 3 c k On h t n 3 we k lat A gu t
 943 thr was less ll g but t dern was
 til p e nt the a t r pa t of th tal Sh
 as lking on the foot Sh n t s n



Fig. 3. Ca 4 N 6 666 Ph t g ph (4 X)
b t d t m d m l r m f m p t s c l t
b b Th h t p th l g d t a l l t d t d h y d
t t g f th l t d p p f t h d

L m r f th A m S h l f R t g l g y
N ayed th f e c m ith d i f f e t d g e e f e
p o s a r y m l l r e f i d t a a s n (F i g)
A l a g d o w m a d n t h t b a o n N e m
b 4 943 Th l y n g p s t u m a f d t
b d m t o a n d t h c k n d b e c t h h h
m c h h d c l t b e
I t h e l b a t r y t h e d u a s l o o k d n t h
g s d e c p t h c h c o n s t d f a g a t i v t h c k
d h d l a b f e c t i c a l b m g 44 m l l
m t r s l o n g b y m l l m e t r s l b y 5 m l l m t
t h c k t l a f t t h e N r a v f i l m f t h p e c m h d
e a l e d t h f i d s p t A e c t m d e
t h g h t s d f c t h c h l e i t e r a c t o
p p t t h d g o s o f t d o t e m a (F i g 12)
e n t h g h t t h d b c m e d c c a t d b f
t h b l o k w t k e

R e c o y a e e n t f l o p e r a t i r e l d t h
p n u m m d t l y H a l t s e e J 7 944

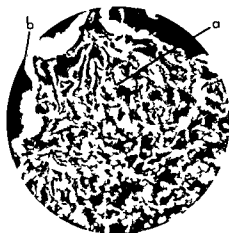
CASE 5 J T S No 6 586 h t m a l g d 9
y c a m t t h C l n n M a r h 6 944 t h
p i n t h i c a l p n d e f e r r d p t t h l f t
s h o l l f a b u t y e a r d t i n l h g l
u l l y i n d i r i t y T h e r a s h t y f
n j r y H h a d b t o l d h h a d a f a t n j

a l e a t h e r l l f 8 m t h t h t b n t
E m n a t n e a l d t h h d b e g h l d t l t d
t t h l f w t h l b l m c l p m a d t
d e s s j t t t h l f t f t h e p p c e c a l p u
p c d b t n h b l t h t p f t h
m t l N c k m t a l m t d t b t p
c t f m a l l d t d t p t h
g f t h e c d e c a l r t b a T h l f t
h l d n e g t

R n t g m f t h r v l p e (F g 4)
l l n b y 8 m l l m t d m
t f t h l f t p e d c l d d j n t p t f t h
d c r v c a l t b a T h e c e n t f t h l e n

Fig. 3. Ca 4 N 6 666 R t g g m l b r y
944 h d f t t f g l t h r k d t

a s m p e d f r a r f i e d a l l t c a s h i c h
t u r n e s o u n d d b y a e f i d h l t h a
f y m a r g n T h e a d j c t p t o n f t h s p o
p a s c l t i c
T h p t t w r f e l t o e u g e n f
b p s y f r p o s i b l o t o g r m T h
b p s y w p e f m e d n M a c h 9 944



F C se 4 N 6 666 Ph t m g ph (4 X)
h t d t m d m l l f m p t s c l t c
b b Th h t p t h l g d t l l t d t d h y d
t t g f t h l t d p p e f t h d

L m r f t h A m y S h l f R t g l g v
N a y e d t h s p e c m n i t h d f f e t d g e s f e
p v m l l r e f e d a a s e n (F g 1)
A l g d o m a d n t h t b o n \ v e m
b 4 0 4 3 Th l y n g p e s t m a s f d t
b e d m t o a n d t h c k d b t h h h
m h h d c l t b e

In the l b o r a t r y t h n d a s e l o k d n t h
g o s s d e c p t h c h e t l f a g e a t l y t h u c k
d h d s l a b f c t i c a l b n m n g 4 4 m l l
m e t r s l o g b m l l m e t s d b y 5 m l l m t
t h c k t l a f t t h e \ r a y f i l m f t h p e c m n h d
a l l t h h l s p t A e c t n m l e
t h u g h t d f c t w h c h l e d t e r a c t n t o
p p t t h d g o s o f t d o t e o m a (F g 1 2)
e t h g h t t u h d b c m e d e s c e a t d b e f o r
t h b l o k w t a k

R e c r y a s n t f l p e a t r e l d t h
p a n i m m d t l H e l t s e e J n 7 0 4 4

CASE 5 J T S N 6 586 h t m a l g d o
y r s c a m t o t h C l n n M a r h 6 0 4 4 t h
p i n t h i c l p n d e f r r d p a n t t h l e f t
h l l f a b u t y e r d t n l a n h g d
u l l n l i t y T h e r a s n h t y f
n y \ H h a l b t l d h h a l a f r a t a d
o a l a t h e r l l f 8 m t h s t h t b n t
E m t a l i t h e l b g h l d t l t d
t t h l f t t h n s l b l m c l e p m a d t n
d e s j t t t h l f t f t h e p p c i c a l p u s
p c a l a b o t n h b l t h e t p f t h
m t d \ c k m t a l m t d t b o t 5 p
c t o f m a l i l l d t l t p t h
g f t h e s c d r v a l t b a T h l f t
h l j n e g t

R n t g m f t h r v l p e (F g 4)
l d l l n b y 8 m l l m t d m
t f t h l f t p e d c l e d d j t p a t s f t h
d c r v c l t b a T h c e t f t h l e i

Fig. 3. Case 4 N 6 666 R t g g m l b r y
944 h d f t t f g l t h k d t

a c m p e d f a r h d a l s l o t a s h c h
t u r n e s u d e d b y a e f i d h l i t h a
f y m a g T h e a d j c t p o r t n f t h s p
p e s a c l t i c
T h p t t r e f e r d t o n e u r g e f
h p y f r a p o s s i b l o t o g c r m T h
b p y w p e f m e d n M a c h 9 944



Fig 2 Cas 4 N 6666 Ph t m g ph (4 X)
h t d t d m l f m p t s c l t
bo b Th h a t p th l g d t l l t d t d h y d
t a c t g f th l t d p f th d

Lo m r f th A m v S h l f Roentg l g
N a y e d th s p c m th d f f e n t d g f
posu a y m l l e f d e (F)
A l a g d o m a d n t h t b o n o e m
b 4 943 Th r l y n g p e t m a s f n l t
b d m t o a n d t h c k d b th h h a
m h h d c l r t b

In the l b r a t r y th J s l k d n t h
g o s s l e c p t h c h e n s t e d f a g e a t t h t h c k
d h d l a b f t c l b n e m s u n g 44 m l l
m t r s l o b m l l m e t s d b 5 m l l m t r s
t h c k t l a f t th N r a y f i l m f t h p e c m h d
a l e l t h e h e d s p t A c t m d
t h u g h t d f c t h i c h r l l t e e c t t o
p p o t t h e d a g o s o f t d o s t e m (F g 2)
e t h g h t t e h a d b e m e d e s i c c a t d b f o r
t h b l o c k t k

R c o y a s n t f l p a t n e l d t h
p n m m d t l y H e l t s e e J n 7 944
C A S E 5 J T S N 6 86 h t m a l g l o
y r s c a m t o t h C l n n M a r c h 6 944 t h
p n t h i c a l p a d f r r d p a n t t h l f t
h l d f a b u t v r d t i o n l a n h g d
u l l y c l i t s Th n h t y f
j v H h a d b t o l d h h d f r a c t d
o a l t h r l l f 8 m t h t h t b i t
E m t e l d t h h d b g h l d t l t d
t t h l f t w t h d b l e m c l p m a d t n
d e s j s t t t h l f t f t h p p c l p u
p c e s a d b t n h b l t h t p f t h
m t d N c k m t a l m t d t b t p
c t o f m a l l l d t d t p t h
r g n f t h e c d c a l t b a Th l f t
h l d e g t

Roentg g m f t h r v c a l p e (F g 4)
l d a l l n b y 8 m l l m t r s d m
t f t h l f t p d e d d j c t p a t f t h
d c r v c a l t e b The n t f t h l i n

Fig 3 Ca 4 N 6666 R t g g m l b r y
944 h d f t t f g l t h u k d t

c m p e d f r f i e d a l l t i c e h c h
t n w e s o u n d e d b a e f i e d h l o t h a
f y m a r g The a d j c t p t n f t h s p o
p a s c l t i c
Th p t r f d t o a e u r g e n f
b o p y f p s b l o t g r m Th
b p v w p e r f m e d n M a c h 9 944



F 4 Ca 5 N 6 S6 Lt l oentg gr m
 M h 6 944 h pe ub l l (by 8 m lb
 t rs) f the ped l r h f th d c l t b
 Th t s scl t d p t d f m th p focal
 bo by fied h lo-l k

Our lab ratio y rec d nly a pat f th spe
 m n c ns st n of a small p c f s ft f abl
 bl od t i ed t s m s r g by o by 3 m ll
 m t rs th sm ll f m cat lag l k nodule
 by 2 m ll met rs dam t it h d Mic osc p
 call th section t y p cal f r teo d t om
 th cula o t g n t c connect t su t d
 l f i d o t o d te bla t nd steocla ts (Fig 5
 f o t p ece)

The patient a d harged t h h m on th 13th
 postope at day While n the ho p tal he c t n
 ed to e n lges c f pan Th p n ha p r
 st d nc h l f th h spit l and ju t enly
 lea ned that th pat t s t r t n for f th
 obs rvat on and t e t m nt

CONCLUSIONS

A discussion of osteoid osteoma a relatively
 recently recognized disease entity of bone is
 considered to be in order as it is felt that it is
 perhaps frequently overlooked or erroneously
 diagnosed. We have misinterpreted the con-
 dition both clinically and histopathologically.

Its diagnosis in the hand of the inexper-
 ienced is most frequently confused with sclero-
 sing nonsuppurative osteomyelitis of Garre
 Brodie's bone abscess and osteogenic sarcoma

Diagnosis is relatively easy for one who is
 acquainted with the symptomatology physical
 roentgenographic findings and histopathology.

The frequency of this disease is likely much
 more prevalent than the literature on the sub-
 ject may lead one to believe.

The age of the patient predominantly in
 the second and third decades of life and the
 persistent mild to severe localized pain with
 exquisite finger point tenderness should
 arouse one to suspect the presence of osteoid
 osteoma.

If the nidus has developed sufficiently the
 roentgenographic picture may be almost patho-
 gnomonic of osteoid osteoma. On the con-
 trary the roentgenogram may be negative
 even though symptoms may have been pres-
 ent for months. This type of case should be
 restudied roentgenographically at a later date
 thus giving more time for the lesion to develop.

Physiologic response to the pathologic pro-
 cess varies materially as to whether it is lo-
 cated in spongy bone (Case Figs 5 and 6)
 or in the shaft cortex of a long bone (Case 4
 Fig 13).

The 5 cases of osteoid osteoma herein re-
 ported are presented not with the idea of con-
 tributing anything new to the subject but
 mainly to try to popularize further and to
 spread the information already known re-
 garding the disease. In this way it is hoped
 that the disease may be more readily and cor-
 rectly diagnosed and appropriate curative
 treatment applied when possible which at
 this time purely surgical.

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4. J. v. H. L. and L. t. I. J. B. S. F.
5. K. 94. 64. S. A. J. S. g. 94. 53. 68.
6. Id. Y. k. St. t. J. M. 94. 3. 33.
7. L. R. M. O. W. Am. J. R. t. g. Th. 94.
8. M. ALLO. T. B. A. F. I. d. J. M. 94.
9. T. M. K. H. J. Am. D. t. A. 93. 8. 7.

BACTERIOLOGICAL STUDIES OF CLOSTRIDIUM WELCHII INFECTIONS IN MAN

With Special Reference to the Use of Direct Smears for Rapid Diagnosis

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In the years since Wilsdon's work 1931 on the classification of *Clostridium welchii* much has been published on the toxins of this clostridium but the amount of work dealing with other aspects is comparatively small

The intensive work on *Clostridium welchii* toxins must ultimately prove of great value for the understanding of infections in man and has already provided the basis of tests for the rapid identification of the *Clostridium welchii* (Petrie and Steabben 1943 Hayward 1943 McClean et al 1943) But its very importance has obscured the necessity for the study of other characteristics of the organism

Investigations undertaken in this laboratory in a very large number of abortional infections and recently in a small series of postoperative and posttraumatic cases have shown that the capacity of the *Clostridium welchii* to invade the tissues rapidly is closely correlated with characteristics other than toxigenicity Consideration of morphology cultural characteristics etc has led to a better understanding of certain aspects of *Clostridium welchii* infections and to the development of rapid diagnostic methods

THE DETECTION OF CLOSTRIDIUM WELCHII BY THE DEMONSTRATION OF CAPSULES

Although the *Clostridium welchii* is universally recognized as a capsulated bacterium comparatively little use has been made of this property for rapid identification

Staining for capsules as a means of identification may be applied to smears from cultures and to smears made directly from material suspected of harboring *Clostridium welchii*

In this laboratory we have found Richard Muir's method highly satisfactory The Indian ink method and others which merely demonstrate an unstained halo around the bacilli are not recommended as such methods do not indicate variation in the structure of the capsule

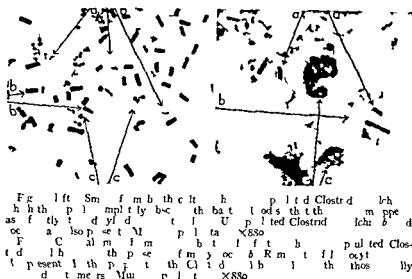
Whether or not strains of *Clostridium welchii* appear capsulated in culture depends very largely on the nature of the medium In Wright's broth containing minced veal less than 40 per cent of the *Clostridium welchii* strains isolated from the vagina are well capsulated but if a small amount of serum or blood is present in the medium approximately 90 per cent of the strains are sufficiently heavily capsulated to be provisionally identified In our experience broths made from liver and those containing liver extract or bile are less satisfactory for demonstrating capsules than is Wright's broth

The presence in the broth culture of other bacteria whether aerobic or anaerobic does not prevent the formation of capsules by *Clostridium welchii* If the strain is distinctly capsulated very small numbers of bacilli can be detected

In this laboratory this method has given very few false positive results Smears of more than 1 000 primary broth cultures have shown capsulated bacilli resembling the *Clostridium welchii* and 99 per cent of these cultures were proved to contain this organism Aerobic spore bearing bacilli may occasionally resemble slightly capsulated *Clostridium welchii* but the frequency of formation of long chains by such aerobes the presence of many spores and the usually granular and faint staining of the aerobic bacilli reduce this source of error to negligible proportions

Very occasionally heavily capsulated strains of the *Bacillus coli* may be mistaken for the

F m h D pu m t P t l gy Th W m H P J d
W k ca ed f h gram t m th N i H b d
Med Res ch cl A I



Clostridium welchii since in smears made from cultures containing blood or serum capsulated *Bacillus coli* sometimes retain the Gram stain and with Muir's method the capsules of both these bacteria stain similarly.

Theoretically the *Clostridium butyricum* the only other known capsulated clostridium could be another source of error. This is of no moment in abortifol infections but in cultures from wound where contamination with the *Clostridium butyricum* is sometimes common (see MacLennan 1943) this possibility should be borne in mind.

The appearance of the capsulated *Clostridium welchii* produced in broth varies. Usually a deeply stained rod completely or partially surrounded by less deeply stained capsular material but forms in which the capsule obscures the bacterial rod may also be present. The latter are very faintly stained and appear as pale blue rectangles or cylinders (Fig. 1).

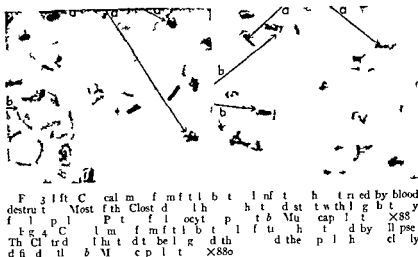
In our experience the demonstration of capsulated rod resembling the *Clostridium welchii* in smears from broth cultures has proved a reliable for rapid diagnosis as the methods which depend on toxin production. In addition it has been found that the former method has the advantage that the medium need not be freshly prepared and when inoculated does not require incubation in the anaerobic jar.

The methods suggested by McClean and associates for detecting in wound exudates the hyaluronidases and other specific exotoxin of the clostridia would be more rapid than cultural method but as yet there is no report of their extensive trial in human infection and they suffer from the disadvantage that they are comparatively complex and call for an experienced technical staff.

The simplest method for the rapid detection of the *Clostridium welchii* is the demonstration of typical capsulated Gram positive rod in smears made direct from the wound or any other site suspected of infection. Not only is it the most rapid method but it calls for the very minimum of equipment and is particularly suited for the routine examination of large numbers of cases in which an attempt is being made to detect the presence of the *Clostridium welchii* before the development of clinically recognizable infection.

Typical capsulated *Clostridia welchii* as seen in direct smear are shown in Figures 2 to 4.

Among the hundred of specimens examined in the last 3 years in this laboratory there was only one instance in which capsulated rod resembling *Clostridia welchii* were reported as present in direct smears when cultures from the same material failed to yield this organism. This discrepancy was probably due to the presence of a heavily capsulated strain of the *Bacillus coli*.



While the use of direct smears is practically never responsible for false positive results it does not detect strains which fail to produce stainable capsules when growing in the tissues or discharges from the infected area but as will be shown in the next section such strains are usually not important in human disease. Some of the strains which are not encapsulated in direct smears produce recognizable capsules when growing in suitable broths.

THE EXAMINATION OF DIRECT SMEARS AS A MEANS OF DETERMINING THE SIGNIFICANCE OF THE PRESENCE OF THE CLOSTRIDIUM WELCHII

In man the mere detection of *Clostridium welchii* in a wound or other potential site of infection is not of great significance. It has long been known that the organism may be present without giving rise to clinically recognizable infection.

Infections following abortion. The chief bacteriological problem in abortifol Clostridium welchii infection is the early diagnosis of the severe generalized infections. It has been apparent throughout the 3 years investigation in this hospital that the recovery of the *Clostridium welchii* be it from the genital tract, the urine, the peritoneal cavity or the blood does not decide whether a severe infection exists or not. The study of smears from the cervical canal however has provided a solution of this problem (2, 3).

The significance of heavily capsulated Clostridium welchii. An investigation of 40 severe *Clostridium welchii* infections including 32 in which this infection was the cause of death showed that in every case whether characterized clinically by blood destruction or by collapse, heavily or very heavily capsulated bacilli could be demonstrated in smears from the cervical canal. In addition these smears showed evidence of destruction of the leucocytes. Recognition of the damage to the leucocytes was found to be particularly important. While the infection was still early, not all the leucocytes were damaged, whereas in the late stage of most of the untreated cases nothing but fragments of destroyed cells were seen. In the early stage of a severe infection there were always many leucocytes; their absence later was almost certainly due to destruction and not to any failure of the leucocytic response. This is borne out by sections of the uterus from such cases which in the decidua at least always showed abundant leucocytes.

The smears represented in Figures 3 and 4 were from patients with well established severe infections.

In every case in which the symptoms typical of a severe *Clostridium welchii* infection developed after the patient's admission to hospital and in which investigations were carried out prior to such development, the cervical smears suggested a severe infection before it

was possible to arrive at a clinical diagnosis

In more than 150 control cases in which infection with the *Clostridium welchii* was localized to the contents of the uterus or those with *Clostridia welchii* in the blood stream but without the symptoms characteristic of a severe infection due to this organism there was not a single instance in which the smears showed heavily capsulated *Clostridia welchii* as well as damage to the leucocytes. Fourteen patients in this group had smears in which there were many capsulated *Clostridia welchii* but in each instance recovery took place without specific treatment for *Clostridia welchii* even though 4 patients showed one or other of the symptoms usually associated with the severe infections.

When there were only a few capsulated *Clostridia welchii* in the cervical smear their significance was sometimes in doubt since in the early stage of the severe infections the leucocytes usually appeared undamaged when only a small number of the *Clostridium welchii* was present. Reference to the apparent size and structure of the capsules was helpful in assessing such smears. In the severe infections the smears always showed forms with the capsule around the bacillus at least as wide as the rod itself and frequently very heavily capsulated bacilli with the width of the capsule greater than the rod.

In smears from the cases with blood destruction the dimensions of the majority of the capsulated rod were 10 μ in length 1 to 2 μ in width and the fragile capsular material at the sides of the rod varied from 1 to 1.5 μ . In 3 cases however the *Clostridia welchii* were larger many of the bacilli being 4 μ in length and a few longer. In smears from the severe infections characterized by collapse the dimensions were different. Approximately half of the bacilli were found to measure 4 μ in length with a width varying from 0.5 to 0.8 μ and the width of the capsules ranged from 0.8 to 1.8 μ .

In addition to the 2 types of well capsulated *Clostridia welchii* there were forms similar to those already described as occurring in broth cultures (Fig. 1) in which the capsule completely obscured the rod. These obscured

forms varied in length from 1.5 to 4 μ and in width from 1 to 2.5 μ . Originally all the obscured forms were regarded as heavily capsulated and therefore suggestive of the presence of a strain sufficiently invasive to cause severe infection. But it is now apparent that only those obscured forms not less than 2 μ in width and in which the difference between length and breadth is not great cause severe infections. The comparatively long and narrow obscured forms (usually 2 to 4 μ by 1 to 1.5 μ) are not highly invasive.

Even when these points of differentiation are borne in mind repetition of the smear is often necessary to determine the significance of a few capsulated *Clostridia welchii* in the cervical smear. The number of *Clostridia welchii* to be seen in the smears and the damage to the leucocytes will increase rapidly if the strain is sufficiently invasive to cause a severe infection. In some cases a dramatic change occurs in a few hours in others a period of 12 hours rarely longer may elapse before a smear typical of a severe infection is obtained.

The significance of uncapsulated Clostridium welchii. The presence of uncapsulated *Clostridia welchii* in the cervical smear even in large numbers is of no serious import. Not one instance of a severe *Clostridium welchii* infection was recorded among more than 100 cases with *Clostridia welchii* in the genital tract in which only uncapsulated rods were present in the cervical smears.

The effect of other bacteria. The presence of other bacteria does not interfere with the recognition of the degree of capsulation of *Clostridium welchii* strains. Figure 2 shows typical capsulated *Clostridia welchii* in the presence of many cocci.

Very few of the bacteria other than *Clostridia welchii* which are associated with abortifacient infection cause appreciable damage to the leucocytes. Of the aerobic bacteria only the highly virulent strains of the *Streptococcus haemolyticus* Group A cause significant cell destruction and this not often. The presence of such streptococci should not be a serious source of error in the majority of the highly virulent strains of *Streptococcus haemolyticus* Group A can be recognized by their heavy

capsules when a smear is stained with Leishman's stain (5)

Of the anaerobic bacteria other than *Clostridium welchii* only the *Clostridium septicum* was observed to cause damage to the leucocytes and only some strains possess this property. In 4 out of 6 cases harboring both these clostridia a severe infection with *Clostridium welchii* could be excluded because of lack of damage to the leucocytes although in one instance the *Clostridium welchii* were heavily capsulated. In the other 2 cases the smears showed considerable damage to the leucocytes but in one the *Clostridium welchii* although heavily capsulated were more readily phagocytosed than is usual in the severe *Clostridium welchii* infections for this reason the case was regarded as primarily an infection with *Clostridium septicum*. The smears from the remaining case showed in addition to the leucocytic damage the capsulation and resistance to phagocytosis typical of the severe *Clostridium welchii* infections. In this instance the *Clostridium welchii* were considered to be of greater importance than the *Clostridium septicum*.

The reliability of cervical smears for the diagnosis of the severe abortional infections due to *Clostridium welchii* can be gauged by the fact that in this hospital during the last 3 years no patient has been treated for a *Clostridium welchii* infection unless the cervical smear suggested that the infecting strain was highly invasive and during this period no patient who failed to show typical smears died from a *Clostridium welchii* infection.

Correlation of symptoms with certain characteristics of the cervical smear. Not only is there this close correlation between the severity of infection and the appearance of the cervical smear but there are further points of difference in the smears corresponding to the patient's outstanding symptoms. In cases in which gross blood destruction occurred the majority of the *Clostridium welchii* in the smears were short stout rod lying singly or in pairs and the capsules were fragile (Fig. 3).

In cases in which collapse and not blood destruction was outstanding the *Clostridium welchii* were quite different in appearance they were longer thinner and the capsules had a clearly defined outline (Fig. 4).

Further evidence of the association between collapse and the thin type of *Clostridium welchii* was afforded by the observation that in a few of the abortional cases with a mild localized *Clostridium welchii* infection signs of shock developed for which there appeared no cause other than that of the infection. In these instances the *Clostridium welchii* in the cervical smears were long and thin.

These various correlations offer strong support for the view that the nature of the infecting strain is of prime importance in determining the severity and type of infection. The results of cultural studies to be discussed later also support this opinion.

Posttraumatic and postoperative infections. Although direct smears have been examined from only 16 wounds harboring *Clostridium welchii* it is already clear that heavy capsulation rapid increase in the number of *Clostridium welchii* in serial smears and damage to the leucocytes point to an actively invasive infection. Conversely poor capsulation failure of *Clostridium welchii* to increase rapidly active phagocytosis and lack of leucocytic damage all indicate that a severe invasive infection is unlikely when two or more of the factors are observed they constitute very strong evidence against the diagnosis of *Clostridium welchii* gas gangrene.

In smears from this series of wound infections the criterion of heavy capsulation was the same as that already described for the abortional cases. As with the latter infections obscured forms that were long and narrow were not considered to be sufficiently well capsulated to indicate the presence of an invasive strain.

In 3 cases of rapidly fatal gas gangrene 2 following minor injuries the smears resembled those of the severe abortional infections. In the other 3 cases of gas gangrene from which smears were examined the amount of leucocytic damage was less than in the fulminating wound infections and in the severe abortional types.

In 3 cases of localized *Clostridium welchii* infection unaccompanied by severe toxemia the smears showed a few heavily capsulated bacilli in 2 and a moderate number of the long thin type in the third but the leucocytes

TABLE I—SUMMARY OF FINDINGS IN 16 CASES

Case	Chancres	Findings in wound	Findings in blood	Findings in tissue	Findings in smears
1	+	+	+	+	+
2	+	+	+	+	+
3	+	+	+	+	+
4	+	+	+	+	+
5	+	+	+	+	+
6	+	+	+	+	+
7	+	+	+	+	+
8	+	+	+	+	+
9	+	+	+	+	+
10	+	+	+	+	+
11	+	+	+	+	+
12	+	+	+	+	+
13	+	+	+	+	+
14	+	+	+	+	+
15	+	+	+	+	+
16	+	+	+	+	+

were not appreciably damaged. In 3 cases in which the *Clostridium welchii* appeared to be mere contaminants in the wound and were probably only multiplying in dead tissue the capsulated bacilli present were of the long obscured type and were unaccompanied by evidence of leucocytic damage. There were 4 other cases without clinical signs of *Clostridium welchii* infection in which Gram positive bacilli resembling this bacterium were not seen in the direct smears although the *Clostridium welchii* was cultivated from the same material. The findings in these 16 cases are summarized in Table I.

The presence of heavily capsulated *Clostridia welchii* in a smear taken from those areas of a wound where spread of infection is suspected should probably always be regarded as suggestive of gas gangrene but repetition of the smears may be necessary to determine the leucocytic damage and should always be undertaken when only a small number of *Clostridia welchii* are present.

If the repeated smears show only a few *Clostridia welchii* this is an indication that up to that time a severe infection due to this organism has not developed. Increasing damage to the leucocytes in the absence of an increased number of typical *Clostridia welchii* should be regarded only as indicative of a severe infection with this organism if the smears fail to reveal the presence of other highly pathogenic bacteria. Caution is needed in interpreting an increased number of *Clostridia welchii* in the absence of recognizable damage to the leucocyte. Such a finding might be compatible with the early stages of gas gangrene but is

certainly not typical of a well established severe infection.

MacLennan in his article on anaerobic infections of war wound laid particular stress on the need for differentiation between gas gangrene (*Clostridial myositis*) and the type of clostridial infection which is unaccompanied by severe toxemia (anaerobic cellulitis). The experience of this laboratory suggests that these two conditions when due to *Clostridium welchii* infection could probably be distinguished by reference to the type and extent of capsulation and the state of the leucocyte as revealed in stained smears.

I have not seen an instance of uncapsulated *Clostridia welchii* in the smear from a wound but it appears probable that such strains are unimportant.

THE BEHAVIOR OF THE *CLOSTRIDIUM WELCHII* IN CULTURE AS A GUIDE TO THEIR SIGNIFICANCE

Infections following abortion. Work carried out in this laboratory has shown that culture of the variants of *Clostridia welchii* responsible for the severe infections possess certain characteristics which help to differentiate them from the strains which are relatively harmless. (1) (3) The strains associated with the severe infections have invariably been very heavily capsulated when grown in Wright's broth containing minced veal while nearly 90 per cent of the strains isolated from cases without symptom of a severe *Clostridium welchii* infection have shown much less capsular material. Indeed more than half of the latter strains have failed to produce any but the smallest amounts of stainable capsular material when grown in the absence of serum. The statement are based on an examination of more than 800 strains.

These results confirm the conclusion drawn from the examination of direct smears that only heavily capsulated strain cause serious infections.

Keppie and Robertson (1944) working with 3/4 hour cultures of *Clostridium welchii* strains grown in a broth containing both serum and glucose and using the India ink method (negative staining) to demonstrate capsulation concluded that a narrow capsule indicated

good toxic ability a wide capsule in most cases poor toxicogenicity. Using this technique they found that strains present in wounds as harmless contaminants showed the widest clear zones around the bacilli.

This finding must not be interpreted as being opposed to the view expressed in this paper that the heavier the capsulation the more likely is the strain to be highly pathogenic. In all work in this laboratory capsulation has been demonstrated by staining the capsules by the method of Richard Muir and not by the negative staining of the India ink method. When these two methods are applied to the same series of cultures the apparent width of capsule around the bacterial rod is not always the same.

In a recent experiment in which smears from young cultures of 8 strains of *Clostridium welchii* were examined by both methods the results were discrepant with 15 of the strains 7 showed medium or wide zones with India ink but only narrow capsules with Muir's stain and in 8 smears the reverse was observed.

Growth characteristics resistance to phagocytosis and to a small extent α toxin production in culture also serve as indications of the significance of a strain of *Clostridium welchii*. The most useful growth characteristics were obtained by using Huntton's hormone agar plates (containing rabbit's blood) and serum neopeptone water (50% horse serum). Details of the method and of the results have been published (13).

All but 3 of 40 strains causing the severe infections with blood destruction gave smooth surface colonies nongranular growth in the serum neopeptone water were resistant to phagocytosis in defibrinated human blood and were active producers of α toxin (the other toxin of *Clostridium welchii* were not studied). Five strains associated with infection characterized by collapse were unstable in regard to colony form the predominant type was smooth or intermediate smooth but flattened colonies with ringed edge were also present. These strains produced a granular deposit in serum neopeptone water were resistant to phagocytosis and produced comparatively little α toxin.

The correlation between severity of infection and any one of the above characteristics was not absolute. Of 8 strains which had not given rise to a severe infection 57 (71%) gave smooth surface colonies and a nongranular type of growth in serum neopeptone water thus resembling the strains causing the majority of the severe infections. Similarly 30 per cent of strains not associated with severe infections were resistant to phagocytosis. But only 5 per cent of the strains which had not caused severe infections were very heavily capsulated in broth produced smooth surface colonies and were resistant to phagocytosis.

Certain individual findings however do brand a strain as harmless. A strain which when first isolated produces no capsular material in Wright's broth has not yet been found responsible for a serious uterine infection. Similarly a strain that produces only completely rough flat colonies or one which is very readily phagocytosed when freshly isolated can be ruled out as a cause of uterine infection that is capable of producing clinical signs.

Posttraumatic and postoperative infections. Tests similar to those used for the cultures from the abortion cases were applied to the *Clostridium welchii* isolated from 6 cases of infected wounds.

In 8 instances the patient suffered from gas gangrene due primarily to infection with this organism. In 7 the *Clostridium welchii* was the only clostridium isolated in the remaining one the *Clostridium bifermentans* was also present. Considered as a group the *Clostridium welchii* strains from these 8 cases differed in colony form from the strains causing the severe abortion infections characterized by blood destruction and in α toxin production from the strains causing the rapidly fatal collapse cases.

In smears from cultures the bacilli were stout square-ended and heavily capsulated. On the Huntton's plates only 1 strain gave perfectly smooth surface colonies 6 were unstable producing either smooth or intermediate smooth colonies a proportion of which showed flat rough outgrowths the remaining strain produced intermediate smooth colonies only. A nongranular type of growth was pro-

TABLE II — SUMMARY OF FINDINGS IN 26 STRAINS

Cha	ms	cl	l	Res	8 ases	3 ase	1 en	8 ase
C	I	S	f	pha	10	1 loc	1 d	1 fec
b	h	f	rm	o- m d	d w	1 Cl th se	am ed Cl	1 w idi Cl w lechn h di
H	vy	S	IS	+				
H	vy	Uns	IS	+	6		3	
H	vy	L	IS	—				
H	vy	I	R	+				
H	vy	I	R	—				
Sl	b	I	S	—				3
Sl	b	I	R	—			3	

duced in serum neopeptone water some times with a flaky deposit. These strains were resistant to phagocytosis and were with 1 exception active producers of α toxin.

Two out of 3 strains isolated from cases of localized *Clostridium welchii* infection unaccompanied by severe toxemia differed from the strains associated with gas gangrene one by producing intermediate rough surface colonies and a granular type of growth in serum neopeptone water and the other in its susceptibility to phagocytosis.

Of 7 strains which appeared to be mere contaminants of wounds 3 could not be distinguished in culture from those of the gas gangrene cases but in each instance direct smears showed that neither the capsulation nor the leucocytic damage was typical of a severe infection. The other 4 strains were only slightly capsulated in broth and readily phagocytosed. 3 of these strains produced intermediate rough and 1 intermediate smooth surface colonies.

The remaining 8 strains of *Clostridia welchii* in this series were from infected wounds which also showed other clostridia the details of which were not available to me. Three strains resembled those associated with the known cases of gas gangrene due to *Clostridia welchii* but the other 5 were readily phagocytosed and 4 were poorly capsulated. This suggested

that in 5 cases of which were fatal gas gangrene it was anaerobes other than *Clostridia welchii* which were the important infecting agents.

The findings in regard to capsulation in broth culture surface colony form and resistance to phagocytosis of the 26 strains isolated from wounds are summarized in Table II reference to which suggests that these characteristics are a less reliable indication of the significance of the *Clostridium welchii* in a wound than the appearance of the direct smear.

In 1 case in this series gas gangrene was accompanied by jaundice and hemoglobinuria. This was the only instance among the traumatic infections in which both the direct smears and the cultural characteristics of the infecting strain were indistinguishable from those of the severe abortional infections with blood destruction. A further parallel was the recovery of the *Clostridium welchii* from the blood and urine during life.

THE MODE OF DEVELOPMENT OF *CLOSTRIDIUM WELCHII* INFECTIONS

The studies of abortional infections showed that the invasiveness of the infecting strain was of paramount importance in the development of the severe *Clostridium welchii* infections. This finding coupled with the observation that many freshly isolated strains of the *Clostridium welchii* were pathogenic for guinea pigs when a toxin free inoculum was used focused attention on the mode of development of infection in man (4).

In the past our understanding of *Clostridium welchii* infection has been retarded by too much stress being placed on the significance of the exotoxins. It was assumed that the bacilli themselves were not invasive and that therefore their introduction into wound caused serious infection only in the presence of considerable tissue damage of foreign bodies of interference with the blood supply etc.

The occurrence of gas gangrene due to *Clostridia welchii* often of a fulminating type following the hypodermic injection of a bland substance or after any other trivial injury is evidence that with some strains the mere in

roduction of the organisms into the tissues will initiate a serious infection

The recent papers of Robertson and Keppie (1941 and 1944) show that toxin production alone as measured by *in vitro* tests does not satisfactorily explain the behavior of *Clostridia welchii* when present in wounds and in our experience toxin production alone has not provided a satisfactory indication of the severity of the abortional infections

Two other observations support the hypothesis that the *Clostridium welchii* in its attack on human tissues is not dependent only on its power to produce lethal exotoxins. First the study of abortional infections in general reveals certain points of similarity between the fulminating infections with *Streptococcus haemolyticus* Group A and those due to the *Clostridium welchii*. In both the infection becomes rapidly generalized and positive blood cultures are usually obtained in the early stages of the illness. In both there is a correlation between severity of infection and intense capsulation of the infecting strain.

Second the exotoxins of *Clostridia welchii* are weak in comparison with those of some of the other highly pathogenic clostridia and yet gas gangrene due to *Clostridia welchii* usually develops more rapidly than do the infections caused by the other anaerobes. This latter observation is in keeping with the view that the *Clostridium welchii* is a potentially invasive organism because of its possession of a capsule.

In a previous publication I have suggested that a better understanding of *Clostridium welchii* infections is afforded if we regard the strains of this organism as divisible into groups according to the invasiveness of the bacilli themselves. A study of some hundreds of freshly isolated strains of *Clostridia welchii* and a consideration of the lesions which are produced in the patients by these organisms has led me to suggest the following 3 groups (4).

The first and most important group consists of those strains which are so highly invasive that they can attack undamaged tissue. Judging by the experience of this laboratory the majority of such strains produce smooth surface colonies are extremely heavily cap-

sulated and are completely resistant to phagocytosis. These highly invasive variants are comparatively rare.

Second there are strains of moderate invasive power they do not readily invade undamaged tissue but apparently can spread rapidly in damaged areas where they produce sufficient exotoxin to damage adjacent tissue and thus cause a spreading infection. In the absence of extensive tissue damage strains such as these are unlikely to cause serious infection in man. These strains show some but not all of the characteristics of highly invasive variants. They are heavily capsulated although as a group less so than the highly invasive variants and are either completely or moderately resistant to phagocytosis by human leucocytes. As a rule they do not produce typically smooth colonies on Hinton's hormone agar plates after 48 hours incubation.

Third there are strains of low invasive power which apparently multiply only in dead tissue and cannot invade adjacent areas even if these are damaged by toxin so that a spreading infection is never produced by such strains. Usually these strains produce rough colonies are poorly capsulated and readily phagocytosed. Occasionally a strain of low invasiveness possesses one but never several of the characteristics of more virulent organisms.

Work on the invasiveness of the *Clostridium welchii* strains is still in progress and further experience may well modify some of our present opinions but not I think our view of the importance of the invasiveness of the *Clostridium welchii* bacilli and of the practical significance of the degree of capsulation and damage to the leucocytes as revealed in smears from the possibly infected area.

The importance of the invasiveness of the *Clostridium welchii* apart from the exotoxins produced has received scant if any attention from recent writers. MacLennan (1943) in his articles on anaerobic infections of war wounds did not stress this point with the result that some of his views are almost certainly not applicable to infections caused by the *Clostridium welchii* alone.

For example this author's statement that the clostridia are primarily and essentially

saprophytes is too sweeping as long as the *Clostridium welchii* is included in the group. Apart from the experimental evidence I find it impossible to regard the *Clostridium welchii* as essentially a saprophyte in view of first the occurrence of rapidly fatal infections following hypodermic injection and second the occurrence in the presence of severe abdominal infections of invasion of the blood stream in the early stage of the disease usually in the absence of extensive damage to the uterus.

The view that the development of *Clostridium welchii* infection in man is largely dependent on the invasiveness of the bacilli themselves has an important bearing on other points raised by MacLennan. This author pointed out that neither in prevention nor in treatment had much advance been made in the last 25 years in spite of the increase in the potency of antisera. While this statement was made in regard to gas gangrene generally, available evidence shows that it is particularly true for *Clostridium welchii* infections. This fact is another argument against the hypothesis that the virulence of the infecting organism is all important. Once it is realized that in the severe types of *Clostridium welchii* infection the invasive power of the bacilli themselves is of considerable importance it is apparent why improvements in antisera have not produced startling results. In earlier work carried out in the laboratory it has been shown experimentally that invasiveness is only partially influenced by antitoxin.

Again MacLennan stated that on the practical ground gas gangrene should be eminently preventable by surgical method alone yet such has certainly not been the case. Clearly here is another good reason for discarding the old idea that *Clostridium welchii* bacilli themselves are nonvirulent and therefore cannot invade any but grossly damaged tissue.

APPLICATION TO THERAPY AND RESEARCH

The earlier sections of this paper have described the use of direct smears and to a lesser extent the use of cultures for the rapid detection of *Clostridium welchii* and as a

means of determining the significance of the organism.

These tests can therefore be used as a guide for treatment. In a case with clinical signs of gas gangrene or other type of clostridial infection smears typical of a severe infection with *Clostridium welchii* will indicate the need for instituting full treatment against the organism whereas if the smear does not suggest a severe infection it focuses attention on the possibility of some other aetiological cause in the patient's symptoms. Thus a more extensive examination of the smear may show clostridia forms resembling *Clostridium septicum* or an infection with anaerobic streptococci or the *Streptococcus haemolyticus* Group A.

Direct smears should play a large part in the management of the case in which the *Clostridium welchii* is detected in a wound but which at that time does not show clinical signs of gas gangrene. In such cases it would be logical to withhold specific treatment as long as the smears did not suggest an actively invasive infection.

Only limited use has so far been made of direct smears. MacLennan (1943) stressed the usefulness of a Gram stained smear in the diagnosis of gas gangrene. But if the *Clostridium welchii* is the infecting organism this is not enough in such case it is essential to use a stain which shows the capsules and does not distort or fail to stain the leucocytes. In the Medical Research Council's War Memorandum on gas gangrene (1941) the significance of the findings in Gram stained smears from wound was discussed in more detail but no mention was made of the demonstration of *Clostridium welchii* capsules to determine either the presence or the significance of the clostridium. Reed and Orr (1941) in their article on the progress of medical science in relation to gas gangrene mentioned the making of Gram stained smears at the same time as attempts at cultivation were undertaken but did not suggest the use of direct smear for the rapid diagnosis of *Clostridium welchii* infections.

Failure to recognize the importance of bacteriological method for the diagnosis of severe *Clostridium welchii* infections is apparent in two recent articles on puerperal infections

In that of Rendle Short (1942) the criteria for the bacteriological diagnosis of the severe *Clostridium welchii* infections were not discussed and in Salms paper "The Occurrence and Significance of *Clostridium Welchii* in the Female Genital Tract" (1944) no mention was made of any laboratory method for assessing the significance of the presence of this organism.

To determine the value of any particular form of treatment in serious *Clostridium welchii* infections knowledge of the invasiveness of individual strains is essential. Any claim of success is quite without justification if cases are included in which the *Clostridium welchii* cultures lacked the necessary invasiveness.

Knowledge of the invasiveness of individual strains is also important for the evaluation of prophylactic measures. Without such an assessment exaggerated claims may be made since any method will succeed if only harmless strains are present.

Since in the severe *Clostridium welchii* infections the invasiveness of the bacilli themselves is as important as toxin production, treatment should be directed against both aspects. There can be little doubt that antitoxin must be employed in all *Clostridium welchii* infections that warrant treatment, but in cases in which the smears indicate the presence of a highly invasive strain therapy with an antibacterial agent effective against such variants is also necessary.

In planning experimental work designed to test therapeutic substances full consideration should be given to all the properties of the strain used as the infecting agent. In a previous article (4) I have pointed out that many of the reports dealing with the treatment of experimental *Clostridium welchii* infections with the sulfonamides prove but little since the strains used were not fully described and the time elapsing since their isolation was not given.

This latter point is most important. Work in this laboratory has shown that many freshly isolated strains of *Clostridium welchii* from human sources are pathogenic for guinea pig when washed cultures are used. But this property is fairly rapidly lost with some strains

in less than 3 months. Similarly resistance to phagocytosis by human leucocytes may quickly disappear during artificial cultivation.

Further evidence of the necessity for using freshly isolated strains has been provided by recent experiments in rats carried out in this laboratory. When rats were infected with a freshly isolated strain from a fatal abortional infection the administration of antitoxin alone failed to save more than a small proportion of the animals while treatment with both antitoxin and an antibacterial agent was highly successful. Repetitions of the experiments over several months showed a decrease in the virulence of the strain as evidenced by an increasingly larger proportion of survivors in the group treated with antitoxin alone.

SUMMARY

1. The rapid identification of the *Clostridium welchii* by the demonstration of stained capsules is described. The method has been successfully applied to smears from broth cultures as well as from tissues suspected of harboring this clostridium.

2. Methods for determining the significance of the presence of *Clostridium welchii* in relation to abortional and posttraumatic infection are discussed. In both types of infection it was found that the degree of capsulation together with the extent of the damage to leucocytes as revealed in direct smears provided a reliable indication of the severity of infection. It is concluded that the examination of smears from the suspected infected area is the most rapid and most reliable means for the bacteriological diagnosis of the severe types of *Clostridium welchii* infection.

3. The development of *Clostridium welchii* infection in man is discussed and it is suggested that the invasiveness of the bacilli themselves apart from toxin production largely conditions the occurrence of clinically recognizable infection.

4. The application of these methods and conclusions to therapy and research is indicated.

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PE RIE G F d S E s D OY B L M J
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 3 RE D G B d O r J H Am J M Sc 94
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 Ro FR S MURIEL d K P J J MES J I 3
 Bact Lo d 94 53 9
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AN EXPERIMENTAL EVALUATION OF AMERICAN COMMERCIAL BIVALENT AND PENTAVALENT GAS GANGRENE ANTITOXINS

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A REVIEW of the history of malignant edema and gaseous gangrene (2) shows that most surgeons who have had experience in the use of gas gangrene antitoxins favor their use but there have been a few who have not been so impressed. One suspects that in some instances those who have condemned the use of serum have failed to distinguish between its prophylactic and therapeutic values that perhaps in some cases the serum has not been used until symptoms were far advanced and then in quantities too small to be of value or under other unfavorable conditions.

This writer believes that gas gangrene serum is not needed at all for wounds which receive prompt adequate surgery that its principal value is prophylactic to prevent or delay anaerobic infection until adequate surgery can be secured that it can never take the place of adequate surgery and that for these reasons it is much more important in relation to war wounds than in relation to civilian wound. But he believes also that it has definite therapeutic values when used in adequate dosage as an adjunct to surgery in the treatment of malignant edema and gaseous gangrene due to anaerobic bacilli.

Early in our study of civilian wounds the writer was asked to make a study of commercial gas gangrene antitoxins. Specimens of these were furnished by seven manufacturers. They came in small rubber capped bottles or syringes each containing one therapeutic dose. The different brands will be designated by the letters A B C D E F and G.

The contents of these containers were in all cases clear or only slightly opalescent liquids and remained so on storage in an electric refrigerator for more than 2 years without any visible evidence of deterioration. All of the tests were made before the dates of expiration printed on the labels.

Serum B the only pentavalent antitoxin had the following stated potency

B cell	perfring	tit xi	000 un ts
B cell	septicus antitox		000 un ts
B cell	h t lyt c ant t xi		3 000 nit
Bac ill	vy t t xi		500 t
B ill	d li tit xi		500 ts

It is to be understood that these are international units but as I have recently shown (3) no two of these standard international units are defined alike in terms of minimal lethal doses of toxin neutralized. Granting that it is possible to define antitoxin units in terms of minimal lethal doses only approximately we find that the approximate protective power in terms of mouse minimum lethal dose of toxins which are represented in this therapeutic dose of antitoxin is as tabulated in the following:

B ill	perf ge t xi	500 000 t 700 000
B cell	septicus t xi	400 000 t 64 000
B cell	h t lyt ca t xi	abo t 35 000
B ill	vy t t xi	ab t 7 500 000
B cell	d li t xi	28 000 t 5 00 000

All of the other serums were bivalent each therapeutic dose containing 10 000 units of Bacillus perfringens antitoxin and 10 000 units of Bacillus septicus antitoxin.

EXPERIMENTS ON BACILLUS PERFRINGENS

Since Bacillus perfringens is the commonest single cause of gaseous gangrene experiments were started in the first place with toxin and subsequently living cultures of this microorganism were used.

TABLE I—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST TOXIN OF BACILLUS PERFRINGENS

Dose		Dose		Lesions	Final
Guinea pig	Weight in grams	Antitoxin	Serum		
66	5	—	—	Edema of lymphatic	Recovered
63		—	—	Edema of lymphatic	Recovered
6		—	—	Marked edema of lymphatic	Recovered
	5	5	—	Marked edema of lymphatic	Dead
	5	A	—	N	Lived
		B	—	N	Lived
6		C	—	N	Lived
6		D	—	Intestinal	Lived
		E	—	N	Lived
	20	F	—	N	Lived
56		G	—	N	Lived

TABLE II—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST TOXIN OF BACILLUS PERFRINGENS

Dose		Dose		Lesions	Final
Guinea pig	Weight in grams	Antitoxin	Serum		
5		—	—	Edema of lymphatic	Dead
8	55	5	—	Marked edema of lymphatic	Dead
8	5	—	—	Marked edema of lymphatic	Recovered
8	5	5	—	Marked edema of lymphatic	Lived
9	5	A	—	N	Lived
90		B	—	N	Lived
86		C	—	N	Lived
		D	—	N	Lived
83		E	—	N	Lived
		F	—	N	Lived
		G	—	N	Lived

EXPERIMENTS WITH THE TOXIN OF BACILLUS PERFRINGENS

A toxin prepared by Dr. M. A. Logan of the University of Cincinnati was supplied. It was packed in ice and shipped by airplane July 18, 1941. This toxin is stated to contain about 100 units of alpha toxin per cubic centimeter as determined by Van Heurden's method. It was said to have been preserved with phenylmercuric acetate and appeared as a clear light yellow liquid with a light sediment of crystals resembling those of tyroine. It was sterile. We always stored it in an electric refrigerator kept at 4 degrees C.

July 1942 a guinea pig weighing 605 grams was injected with 1 cubic centimeter of this toxin subcutaneously. This animal developed marked subcutaneous edema with liquefying necrosis over the site. On the following day the edema was apparently subsiding but the animal was very sick and died about noon. Its belly wall was full of mottles but there was no evidence of penetration of the abdomen. The abdominal viscera appeared to be normal but the lungs were congested.

A smaller guinea pig weighing 45 grams was injected subcutaneously with 1 cubic centimeter of the same toxin boiled 2 minutes. This animal developed overnight marked subcutaneous edema without liquefaction but recovered.

A guinea pig weighing 25 grams inoculated with 0.1 cubic centimeter of unboiled toxin subcutaneously developed marked edema overnight which became severe at 48 hours. At 72 hours there was liquefying necrosis and at 96 hours the skin ruptured after which an eschar formed. This scar sloughed in 16 days leaving a clean healthy granulating area which eventually healed.

A guinea pig weighing 225 grams given 0.05 cubic centimeter of toxin had a moderate edema and followed a course to recovery similar to that of the preceding animal.

Experiment 1. October 14 a series of guinea pigs was injected with freshly made mixtures of 1 cubic centimeter of this toxin and 1 cubic centimeter of the antivenom serum. Four control animals all but one had a greater than the receiving mixture received graded doses of toxin alone. Table I summarizes data.

TABLE III — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST TOXIN OF BACILLUS PERFRINGENS

Guinea pig	Weight	Dose of toxin	Antitoxin	Dose of antitoxin	Lesions	Final result
355	355	—	—	Edema lysis rupture	Death	5 days
6	30	—	—	Mild edema lysis	Recovered	
7	35	—	—	Marked edema lysis	Recovered	
36	5	—	—	Edema lysis	Recovered	
365		A		N	L	d
65		B		N	L	d
3	355	C		Mild edema lysis	Death	3 days
35		D		N	L	d
		F		N	L	ed
		F		Mild edema lysis	Recovered	
		G		N	L	ed

Table I shows that all of the controls developed the characteristic edema with subcutaneous lysis rupture of the skin in 2 cases recovery in 3 and death after 11 days by secondary infection of an adherent scab in the case of the animal that received the smallest dose of toxin

One of the test animals developed a slight transient edema none of the rest showed any symptoms

Experiment 2 October 23 194 a series of guinea pigs was injected with mixtures of 1 cubic centimeter of toxin and 0.1 cubic centimeter of each of the antitoxins along with 4 of the heaviest animals as controls receiving graded doses of toxin The data are summarized in Table II

Table II shows that the test dose of 1 cubic centimeter killed a large guinea pig in less than 22 hours while marked lesions were produced with smaller doses down to 0.15 cubic centimeter and 2 of these animals also died later with abdominal perforations

None of the test animals receiving 0.1 cubic centimeter of the various sera showed any effects whatever

TABLE IV — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST TOXIN OF BACILLUS PERFRINGENS

Guinea pig	Weight grams	Dose of toxin	Serum	Dose of serum	Lesions	Final result
3	35	—	—	—	Marked edema lysis	Death 5 days
3	35	—	—	—	Mild edema lysis diffuse	Death 3 days
33	75	—	—	—	Mild edema vesicular	Recovered
37	5	5	—	—	Mild edema lysis rupture	Recovered
5	55		A	00	Modest lymphatic	Death 4 hours
	55		B	00	Edema lymphatic vesicular	Recovered
3			C		Edema	Death 3 days
3			D	00	Modest edema	Death 4 hours
6	5		E	00	Edema lymphatic	Death 3 hours
5			F		Necrosis	Death
			G	00	Edema lymphatic vesicular	Recovered

Confirming results
Experiment 3

Experiment 3 November 4 1942 a series of guinea pigs was injected with mixtures of 1 cubic centimeter of toxin and 0.01 cubic centimeter of each of the antitoxins along with the usual controls The data are summarized in Table III

Table III shows that the test dose of 1 cubic centimeter killed a large normal guinea pig in about 40 hours Guinea pigs receiving smaller doses down to 0.03 cubic centimeter all showed characteristic lesions but recovered

Five of those receiving mixtures of 1 cubic centimeter of toxin and 0.01 cubic centimeter of antitoxin showed no result but in 2 instances this dose of antitoxin failed to protect against the development of the usual lesions 1 of these guinea pigs died on the 5th day but the other one recovered slowly

Experiment 4 November 19 1942 a series of guinea pigs was injected with mixtures of 1 cubic centimeter and 0.001 cubic centimeter of antitoxin except that in the case of antitoxins C and F 0.01 cubic centimeter was used to recheck the results in Experiment 3 The usual controls were used The results are shown in Table IV

TABLE V—SUMMARY OF EXPERIMENTS 1 TO 4
ON PROTECTIVE ACTION OF GAS GANGRENE
ANTITOXIN AGAINST TOXIN OF BACILLUS
PERFRINGENS

N. m. be gu p gu	Ave f h p as	D f	Serum	D f ru	L	D d	L d
	8		—	—	Typ cal		
	3	5	—	—	Typ cal	†	
	3	5	—	—	Typ cal		
			—	—	Typ cal	†	
	3		—	—	Typ cal	†	—
			—	—	Typ cal		
	5		—	—	Typ cal		
			A		N		
	3				N		
	65				N		
	5			∞	Typ al		—
			B		N		
					N		
	6				N		
	5			∞	Typ l		—
			C		N		
					N		
					Typ l		—
			D		N		
					N		
	5				N		
				∞	Typ cal		—
			F		N		
	5				N		
					N		
	∞			∞	Typ cal		—
			F		N		
					N		
					Typ cal		—
					N		
			G		N		
	5				N		
	5				N		
				∞	Typ l		—

S r v a l h e d a r l r u r f k n h d a b a b l d t o
s e c d a r y l e s i o n s f a d h h s c h a r s

against 1 cubic centimeter of *Bacillus perfringens* toxin. Of the two serums which failed in Experiment 3 to protect in a dose of 0.01 cubic centimeter serum C failed again here confirming the earlier result while serum F protected fully disagreeing with the result in Experiment 3. Serum F should have been tested in a dose of 0.001 cubic centimeter but this was not done.

The results of Experiments 1 to 4 are combined and summarized in Table V.

Table V shows that 1 cubic centimeter of *Bacillus perfringens* toxin killed 3 of 4 control guinea pigs within 2 and 40 hours respectively 1 in 5 days. One animal in which early rupture of the skin occurred survived and the lesion healed completely in about 7 weeks. Of 2 control animals receiving 0.5 cubic centimeter of toxin one recovered the other developed an adherent eschar which became secondarily infected resulting in death in 14 days. Similar accidents occurred in 3 guinea pigs receiving 0.2 and 0.125 cubic centimeter of toxin while a total of 8 control guinea pigs receiving doses of from 0.05 to 0.5 cubic centimeter showed the typical early edema and lysis followed by loss of fluid either by rupture of the skin or by slow leakage and absorption formation of eschars granulation and complete healing in 6 to 8 weeks. In evaluating these controls emphasis is placed upon the characteristic lesions produced by the toxin during the first 4 hours rather than upon death or survival of the animals then or later as these terminal events are so dependent upon uncontrollable accidents such as early rupture of the skin or later secondary infections of the large adherent eschars which always form if the animal survives the earlier effects of the toxin.

Five of the 7 brands of antitoxin tested gave complete protection against 1 cubic centimeter of this toxin in doses of 0.01 cubic centimeter or larger. All 5 failed in a dose of 0.001 cubic centimeter. Two which gave complete protection in a dose of 0.1 cubic centimeter failed at 0.01 cubic centimeter but one of these gave complete protection at 0.01 cubic centimeter when retested later these were not tested at 0.001 cubic centimeter for lack of time.

Table IV shows that all 5 of these serums tested for prophylactic action in a dose of 0.001 cubic centimeter failed to protect guinea pigs

EXPERIMENTS WITH LIVING CULTURES OF BACILLUS PERFRINGENS

Experiment 5 January 8 1943 a series of guinea pig was used to test both the prophylactic and therapeutic action of serum B against a virulent culture of *Bacillus perfringens*. The culture selected was my old *Bacillus welchii* No 36 which was isolated in 1918 from a swelled can of commercially canned Swiss chard (4). This culture has been maintained ever since in deep brain medium or deep 1 per cent agar at room temperature and has retained its originally high virulence remarkably well having never failed in all these 5 years to kill overnight guinea pigs with typical lesions in a dose of 1 cubic centimeter or less. It always produces a massive edema on subcutaneous injection followed very soon by extensive spreading lysis emphysema and death within 18 to 4 hours. It belongs to Wilsdon's type A (1).

One cubic centimeter of a 16 hour culture of *Bacillus perfringens* No 15196 (old No 36) in glucose broth in a constricted tube with marble seal (5) was injected into each of 10 guinea pigs during an interval of 1 minute. The heaviest animal received no treatment. It died in exactly 6 hours on autopsy the characteristic emphysema and lysis were seen. A culture from the heart's blood was sterile. The lightest animal received 1 cubic centimeter of serum B simultaneously. At 6 hours there was a slight edema which subsided overnight. It survived without any visible effect. The remainder of these guinea pigs were injected subcutaneously at intervals up to 6 hours with 1 cubic centimeter or 4 cubic centimeters of serum B as indicated in the following protocol.

Guinea pig No 150 eight 33 g m d
cubic centimeter of culture subcutaneously
intramuscularly was given. Subcutaneous emphysema and
lysis were present but the right blood was sterile. Animal
died at 6 hours.
Guinea pig No 49 weight 35 g m ed
1 cubic centimeter of serum subcutaneously. At 6
hours there was slight edema which subsided at
day. Lived.
Guinea pig No 56 weight 245 g m At 6 hours
there was slight edema and subcutaneous emphysema
serum was given subcutaneously at 6 hours. Slight
edema at 4 hours and subcutaneous emphysema at 4
hours. Timers at 4 hours and 6 hours. Timers at 4
hours and 6 hours. Timers at 4 hours and 6 hours.

was not sick at 48 hours the fluctuating area was
drying up at 72 hours weight was 225 grams and
necrotic eschar was 5 centimeters in diameter at
11 days a dry adherent eschar 3 centimeters in diameter
was present. Lived.

Guinea pig No 148 weight 28 grams At 1 hour
there was slight edema and 4 cubic centimeters of
serum was given subcutaneously at 6 hours. Slight
edema at 24 hours slight necrosis at 48
hours the edema was drying up at 72 hours the
dry area of necrosis was 1 centimeter across at 11
days no edema was noted. Lived.

Guinea pig No 155 weight 3 grams At 2 hours
there was slight edema and 1 cubic centimeter of
serum was given subcutaneously at 6 hours moderate
edema at 24 hours not ill area of liquefaction
and necrosis measured by 2 centimeters at 48 hours
area of necrosis drying up at 72 hours small dry
area of necrosis by 1 centimeters at 11 days about
the same. Lived.

Guinea pig No 154 weight 3.5 grams At 2 hours
there was slight edema and 1 cubic centimeter of
serum was given subcutaneously at 6 hours moderate
edema at 24 hours animal was not ill area of
liquefaction and necrosis measured by 3 centimeters
at 48 hours area of necrosis was drying up at
72 hours dry area of necrosis was 1 centimeter
across at 11 days but the same. Lived.

Guinea pig No 137 weight 3.5 grams At 3 hours
there was slight edema and 1 cubic centimeter of
serum was given subcutaneously at 6 hours moderate
edema at 4 hours not ill area of necrosis
was 2 by 3 centimeters at 48 hours area of necrosis
drying up at 11 days dry adherent eschar 2 by 3
centimeters. Lived.

Guinea pig No 145 weight 3.5 grams At 3 hours
there was slight edema 4 cubic centimeters of serum
was given subcutaneously at 6 hours moderate
edema at 24 hours not ill area of necrosis by 3
centimeters was drying up at 48 hours dry area of
necrosis 2 by 3 centimeters at 11 days dry adherent
eschar 2 by 3 centimeters. Lived.

Guinea pig No 5 weight 335 grams At 6 hours
moderate edema and emphysema were noted. One
cubic centimeter of serum was given subcutaneously
at 24 hours there was present a marked edematous
area 4.5 centimeters by 7 centimeters with a small
area of 1 centimeters across. The area was painful
but a malapparently was not sick at 48 hours
about the same. At 72 hours two areas of lysis were
noted each 3.5 centimeters across and continued by
sinus fluctuating moist and painful at 96 hours
eight 335 gram areas dry at days granulating
2 centimeters by 3 centimeters. Lived.

Guinea pig No 53 weight 365 grams At 6
hours marked edema emphysema and lysis
noted. Four cubic centimeters of serum was given
subcutaneously. At 24 hours edema of lysis 4.5 centimeters
by 7 centimeters painful but a malapparently
not sick at 48 hours fluctuating area 3 centimeters
by 5 centimeters by 5 centimeters by 5 centimeters
not sick at 72 hours about the same. Same. Same. Same.

TABLE VI — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST *BACILLUS SEPTICUS*

Guinea pig number	Dose of culture		Dose of antitoxin		Lesions	Final result
	Weight in grams	Dose of antitoxin	Serum	Dose of serum in c.		
76	35		—	—	Typical	Dead 6 hours
77	3			—	Typical	Dead 6 hours
78	5		—	—	N	Lived
75	20	Do	—	—	N	Lived
7	8		A		N	Lived
6	30		B		Delayed	Dead 5 days
6	8		C		N	Lived
69	9		D		N	Lived
6	8		E		Typical	Dead 1 hour
6			F		N	Lived
6			G		Negative	Lived

week previous with c. *Bacillus perfringens* to infect heart blood & wound pure culture of *Bacillus septicus*

in the ruptured skin 96 hours about the same weight 340 grams at 4 days clean granulating area 4 cent met rs over chest wall healthy Lived

It is clear from these data that serum B had not only prophylactic but marked therapeutic action against infection with *Bacillus perfringens* saving the lives of all treated animals in of which treatment was not started until the control animal was already dead

EXPERIMENT ON *BACILLUS SEPTICUS*

In order to utilize the animals surviving Experiments 1 and 2 on *Bacillus perfringens* these were tested for passive immunity to *Bacillus septicus*. The culture used for this experiment was my No. 397A which was received in September 1916 from Dr. J. P. Scott of Kansas State College Manhattan Kansas as Robertson's *Vibrio septique* No. 282 N. I. F. Type. Lister Institute 1923

Experiment 6 October 8 1914 a series of guinea pigs was injected subcutaneously with *Bacillus septicus* No. 2397A grown for 24 hours in a 1 per cent glucose meat broth medium in the doses which are indicated in Table VI

The control animals were all fresh and unused prior to this test the test animal had all received freshly made mixtures of 1 cubic centimeter of the indicated antitoxins with 1 cubic centimeter of the toxin of *Bacillus perfringens* in Experiment 1 a week previously Six of these had shown no symptoms while seven of one guinea pig No. 56 had had a slight transient edema

The results are shown in Table VI

Table VI shows that *Bacillus septicus* killed large guinea pigs in a dose of 0.1 cubic centimeter in about 6 hours while 0.01 cubic centimeter had no apparent effect. Those animals which died showed the postmortem subcutaneous and pulmonary congestion edema and light emphysema so characteristic of animals dying with infection by *Bacillus septicus*. The heart's blood yielded pure cultures of *Bacillus septicus* and the characteristic filaments were demonstrated in every instance upon the surfaces of the livers

Five of the animals injected with 1 cubic centimeter of the different gas gangrene serums a week previously were still protected completely against a dose of culture ten times as large showing no lesions of any kind and surviving

One animal which had received serum B was apparently well on the 4th day but was found dead on the 5th day with characteristic lesions and a pure culture of *Bacillus septicus* in the heart's blood. Another which had received serum E died along with the controls in about 16 hours with similarly characteristic postmortem findings

Experiment 7 October 30 1914 a similar experiment was made with the guinea pigs used in Experiment 1 as test animals. These had received freshly made mixtures of 0.1 cubic centimeter of the various serums with 1 cubic centimeter of *Bacillus perfringens* toxin one week previously and had shown no symptoms. All other conditions were the same except that a 48 hour meat broth culture of *Bacillus septicus* 2397A was used. The results are shown in Table VII

Table VII shows that 0.1 cubic centimeter of the test culture of *Bacillus septicus* killed a guinea pig in about 4 hours while 0.01 cubic centimeter had no apparent effect

TABLE VII — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST BACILLUS SEPTICUS

Guinea pig number	Volume of serum	Dose of serum	Serum	Dose of antitoxin	Lesions	Final result
99	3	—	—	Typical	Delayed	Death 18 hours
	5	—	—	Typical	Delayed	Death 4 hours
	5	—	—	N	Delayed	Death 18 hours
	3.5	—	A	Typical	Delayed	Death 18 hours
90	5	—	B	Delayed	Delayed	Death 36 hours
86	3.5	—	C	N	Delayed	Death 18 hours
	5	—	D	Typical	Delayed	Death 18 hours
88	3	—	E	Typical	Delayed	Death 18 hours
4	3.5	—	F	Typical	Delayed	Death 18 hours
	5	—	G	N	Delayed	Death 18 hours

TABLE VIII — PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN AGAINST BACILLUS SEPTICUS

Guinea pig number	Volume of serum	Dose of serum	Serum	Dose of antitoxin	Lesions	Final result
96	5	—	—	Typical	Delayed	Death 18 hours
5	3.5	—	—	Typical	Delayed	Death 18 hours
9	0.5	—	—	N	Delayed	Death 18 hours
		—	A	Typical	Delayed	Death 18 hours
3	5	—	B	Typical	Delayed	Death 18 hours
		—	C	Typical	Delayed	Death 18 hours
3	6.5	—	D	Typical	Delayed	Death 18 hours
3	3	—	E	Typical	Delayed	Death 18 hours
81	90	—	F	Typical	Delayed	Death 18 hours

each guinea pig was inoculated with 0.1 cubic centimeter of antitoxin and 0.1 cubic centimeter of culture of *Bacillus septicus*.

Four of the animals that had been protected against *Bacillus perfringens* with 0.1 cubic centimeter of antitoxin died in about the same time as the control which received the same amount i.e. 1 cubic centimeter of culture. 1 died in about 36 hours. All of the animals that died showed the characteristic pathologic changes aforementioned and yielded pure cultures of *Bacillus septicus* in culture from the heart's blood.

Two animals which had been inoculated with serums C and G showed no symptoms and survived.

Experiment 8 November 10 1942 the guinea pigs which had received 0.1 cubic centimeter of the different antitoxic serums along with 1 cubic centimeter of *Bacillus perfringens* toxin 6 days previously were used. One of these animals still had a large but clean eschar. Serum G was not represented the corresponding animal having died in Experiment 3. A 24 hour glucose broth culture of *Bacillus septicus* 2397A grown in a constricted tube (5) was used as the test culture. The results are shown in Table VIII.

Table VIII shows that only one animal in this experiment survived i.e. the control

which received only 0.1 cubic centimeter of culture. The first control and all but one of the test animals were found dead in 17 hours. The second control guinea pig No. 115 and guinea pig No. 118 died in 21 and 0 hours respectively.

All of those that died excepting No. 118 showed the usual pathogenic changes and positive heart's blood cultures. No. 118 was the one which had a large healing eschar resulting from its prior injection with *Bacillus perfringens* toxin. This animal died in 20 hours but showed only a moderate subcutaneous edema and no marked congestion either of the subcutaneous tissues or of the lungs and its heart's blood culture was negative. The observations suggest a possibly adjuvant action.

Experiments 6, 7 and 8 are combined in Table IX.

It would not be fair to compare the summary of experiments on *Bacillus septicus* culture with that on *Bacillus perfringens* toxin owing to the diversity of factors involved such as the use of whole culture instead of toxin and the lapse of a week's time from the injection of the antitoxin before the cultures were injected. Therefore while a

TABLE IX—SUMMARY OF EXPERIMENTS 6 7
AND 8 ON PROTECTIVE ACTION OF GAS CAN
GRENE ANTITOXIN AGAINST BACILLUS SEP
TICUS

Num- ber of guinea pigs	Ave weight in grams	Dose of toxin in c.	Serum	Dose of serum	Les- ions	Died	Lived
3			—	—	Typical	—	—
3			—	—	Typical	—	—
90			—	—	N	—	—
33			A		N	—	—
5					Typical	—	—
3					Typical	—	—
80			B		Delayed	—	—
5					Delayed	—	—
3					Typical	—	—
3			C		N	—	—
5					N	—	—
3					Typical	—	—
5			D		N	—	—
					Typical	—	—
6					Typical	—	—
			E		Typical	—	—
3					Typical	—	—
					Typical	—	—
			F		N	—	—
					Typical	—	—
					Typical	—	—
			G		N	—	—
					N	—	—

higher percentage of animals injected with *Bacillus septicus* died in spite of prior injections of antitoxin it is not possible to conclude that these serums had less protective action against *Bacillus septicus* than against *Bacillus perfringens*. The important conclusion seems to be that all but one serum had marked protective action against at least 10 fatal doses of culture when given a week previously in a dose of 1 cubic centimeter and in 2 instances in a dose of 0.1 cubic centimeter. Two serums B and E apparently had slight protective power under these conditions but the next experiment showed that one of these B was by no means devoid of prophylactic value.

One notable difference in the action of *Bacillus septicus* and *Bacillus perfringens* is to be

noted. Guinea pigs frequently survive and recover perfectly after having severe lesions from either the toxin or culture of *Bacillus perfringens* but they rarely do so after an injection of *Bacillus septicus* which produces noticeable lesions. Furthermore guinea pigs inoculated with small doses of *Bacillus septicus* often show no signs of illness at all for a day or so but succumb rapidly once infection that is septicemia really starts. In this respect an infection with *Bacillus septicus* resembles an infection with *Bacillus anthracis*.

Experiment 9 January 9 1943 a series of guinea pigs was used to test the prophylactic and therapeutic value of serum B against *Bacillus septicus*. Upon analyzing the data already collected we later realized that this was really one of the two least favorable samples of antitoxin available for such an experiment. It was intended to extend these tests to all of the other serums but this was impossible because of the limitations of time.

Each of 12 normal guinea pigs was injected subcutaneously in an interval of 13 minutes with 1 cubic centimeter of a glucose broth culture of *Bacillus septicus* 2397A grown for 3 days in a constricted tube with marble seal (5). Three served as untreated controls on dosage 2 of these died in 3 hours 1 in 48 hours all with typical pathology and positive heart's blood cultures. One received 1 cubic centimeter of serum B simultaneously it never showed any symptoms. The others were treated at intervals by subcutaneous injection of 1 or 4 cubic centimeter of serum B as indicated in the following protocol with the results noted.

Guinea pig No. 68 weight 37 grams O cub c
e timer f cult wa gi n subcuta usly
An mal w s d ad 3 h urs
Guinea pig No. 57 weight 35 grams O t th
c b c e timer f ultu e was gi subcuta
ouly 1 mal wa dead n 3 ho rs
Guinea pig No. 5 weight 34 grams O hun
d edth cubi c ntumete of c ltu e was gi e subcu
tan u ly At 3 h urs th r was sl ght b tan
ous edema An m l w o t s k It w s d ad 48
hours

G : ea p g No 16 weight gr ms O c b c
c nt m te f c ltu plus 1 c b c nt m te of
rum B w r gi s b ut cou ly No e dlt
L d

G : p g N 66 weight 5 g ms O c b c
t m t f cult w s o r e ubc t eo sly At

hours the animal showed slight edema 1 cubic centimeter of serum B was given subcutaneously at 25 hours slight edema not seen at 48 hours dry necrotic area 1 centimeter across Lived

Guinea pig No 158 weight 55 grams One cubic centimeter of culture was given subcutaneously At 2 hours slight edema 4 cubic centimeters of serum B was given subcutaneously at 3 hours slight edema not seen at 48 hours dry necrotic area 15 centimeter across Lived

Guinea pig No 159 weight 29 grams One cubic centimeter of culture was given subcutaneously At 4 hours 2 minutes slight edema One cubic centimeter of serum B was given subcutaneously at 23 hours slight edema not seen Animal as dead in 47 hours

Guinea pig No 160 weight 300 grams One cubic centimeter of culture was given subcutaneously At 4 hours 6 minutes slight edema 4 cubic centimeters of serum B was given subcutaneously Animal was dead in 23 hours

Guinea pig No 161 weight 3 grams One cubic centimeter of culture was given subcutaneously At 75 hours moderate edema One cubic centimeter of serum B was given subcutaneously Animal was dead in 3 hours

Guinea pig No 167 weight 3 grams One cubic centimeter of culture was given subcutaneously At 75 hours moderate edema Four cubic centimeters of serum B was given subcutaneously Animal was dead in 23 hours

Guinea pig No 161 weight 320 grams One cubic centimeter of culture was given subcutaneously At 1 hour marked edema 1 cubic centimeter of serum B was given subcutaneously Animal was dead in 3 hours

Guinea pig No 165 weight 33 grams One cubic centimeter of culture was given subcutaneously At 12 hours marked edema 1 cubic centimeter of serum B was given subcutaneously Animal was dead in 3 hours

All animals that died showed the usual pathologic picture on autopsy and all heart blood cultures yielded *Bacillus septicus*

The results showed that serum B had definite prophylactic but little therapeutic value under the conditions imposed Unfortunately it was not possible to repeat this experiment with weaker test doses which the writer believes would have given more favorable results or to test the therapeutic action of the other brand of serum some of which might well have given much better results

EXPERIMENTS ON *BACILLUS NOVI*

For these experiments my *Bacillus novyi* No 15107 (old No 140) was selected This culture was received from Dr Michel Wein

TABLE V.—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN B AGAINST *BACILLUS NOVI*

G	Weight	Dose	Dose	Lesion	Final result
g	grams	cc	cc		
7	30	—	—	Typical	Dead in 4 hours
		—	—	Typical	Dead in 4 hours
	60	—	—	Typical	Dead in 6 hours
6	60	0.05	—	Typical	Recovered
		—	—	Negative	Lived
0.05		—	—	Negative	Lived
	5	—	—	Typical	Dead in 4 hours
	0.05	—	0.05	Typical	Dead in 4 hours

If blood culture from heart blood

berg of the Pasteur Institute in Paris France in March 1921 as *Bacillus oedematiens* No 128 Without entering upon a discussion of the long controversy over the correct name of this organism let us say simply that we regard *Bacillus novyi* as the earliest valid binomial for this species (4)

Owing to the increased number of infections by *Bacillus novyi* encountered during the African campaign (9) the inclusion of antitoxin for *Bacillus novyi* in polyvalent anaerobic gas gangrene serum suddenly became a matter of considerable urgency However serum B was the only one claiming to contain antibodies for this species at the time these experiments were in progress Two experiments were conducted with this serum

Experiment 10 February 25 1943 a series of guinea pigs was injected with *Bacillus novyi* 15107 grown for 3 days in glucose broth in a constricted tube with marble seal (5) Four animals served as controls on dosage while 4 others comprised the test with serum B given simultaneously The results are shown in Table V

Table V shows that 1 cubic centimeter of this culture of *Bacillus novyi* killed small guinea pigs in about 22 hours One hundredth cubic centimeter killed one in about 46 hours with typical pathologic changes but while 0.001 cubic centimeter produced a marked anasarca this gradually subsided without rup

ture of the skin and this animal slowly recovered

On the other hand guinea pigs receiving 1 cubic centimeter and 0.1 cubic centimeter of serum simultaneously with 1 cubic centimeter of culture showed no symptoms at all and lived but those receiving doses of 0.01 cubic centimeter and 0.001 cubic centimeter died about the same time as the controls. Cultures were made from the heart's blood of 4 of the animals that died but all were negative

PROPHYLACTIC AND THERAPEUTIC ACTION OF SERUM AGAINST BACILLUS NOVI

Experiment 11 March 5 1943 a series of 11 guinea pigs was injected subcutaneously during a period of 35 minutes with *Bacillus novyi* 15197 grown for 48 hours in glucose broth in a constricted tube with marble seal (5)

Three animals served as controls on dosage 2 as prophylactic controls on the serum. The details of treatment with serum B and the results are shown in the following protocol

Controls Dosage

Guinea pig No. 4 weight 55 grams 1 cubic centimeter of culture was given subcutaneously. At 24 hours the animal was moribund. A small amount of blood was noted in the lungs.

Guinea pig No. 98 weight 45 grams 0.01 cubic centimeter of culture was given subcutaneously. At 4 hours moderate edema was noted. Animal was dead in 48 hours.

Guinea pig No. 176 weight 43 grams 0.001 cubic centimeter of culture was given subcutaneously. At 48 and 72 hours slight edema was noted. Animal recovered.

Control on Serum

Guinea pig No. 1 weight 2 grams 1 cubic centimeter of culture plus 0.01 cubic centimeter of serum was given subcutaneously. Result: Lived.

Guinea pig No. 91 weight 370 grams 1 cubic centimeter of culture plus 0.001 cubic centimeter of serum was given subcutaneously. Result: Lived.

Tests on the Specificity of Serum

Guinea pig No. 186 weight 365 grams 1 cubic centimeter of culture was given subcutaneously. At 4 hours symptoms of culture were noted. Animal was given subcutaneously 1/4 hour moderate edema at 48 hours. Slight edema at 72 hours. Animal died. Obvious skin atrophy. Complete recovery. Lived.

Guinea pig No. 94 weight 35 grams 1 cubic centimeter of culture was given subcutaneously. At 4 hours light edema 1 cubic centimeter of serum was given subcutaneously at 24 hours moderate edema at 48 hours. Edema subsiding at 96 hours. Edema almost gone at 6 days completely recovered. Lived.

Guinea pig No. 19 weight 33 grams 0.01 cubic centimeter of culture was given subcutaneously. At 6 hours slight edema 1 cubic centimeter of serum was given subcutaneously at 24 and 48 hours. Moderate edema at 72 hours and 96 hours. Slight edema at 12 hours. Found dead (pneumonia). Died.

Guinea pig No. 189 weight 31 grams 0.01 cubic centimeter of culture was given subcutaneously. At 8 hours slight edema 1 cubic centimeter of serum was given subcutaneously. At 4 hours and 48 hours moderate edema at 72 hours. Edema subsiding. At 96 hours completely recovered. Lived.

Guinea pig No. 95 weight 305 grams 1 cubic centimeter of culture was given subcutaneously. At 24 hours moderate edema 1 cubic centimeter of serum was given subcutaneously at 48 and 72 hours. Severe edema on lung at 96 hours. Severe edema in ruptured at 1 day. Adhesions. Result: Lived.

Guinea pig No. 99 weight 300 grams 0.01 cubic centimeter of culture was given subcutaneously. At 24 hours moderate edema at 27 hours. Edema subsiding at 54 days. Completely recovered. Lived.

All animals that died were examined post mortem. The characteristic moderate to marked subcutaneous edema was observed in each instance. There was some blood tinged effusion but little or no true congestion and no emphysema or lysis. The lungs were pale except in the case of guinea pig No. 190 which showed a moderate congestion of all lobes indicating pneumonia. There were no other gross changes in the viscera. Heart blood cultures were made in each case but all were negative.

This experiment showed that gas gangrene serum B had considerable therapeutic action in guinea pigs inoculated with a small but fatal dose of *Bacillus novyi* if used within 4 hours.

EXPERIMENTS ON BACILLUS HISTOLYTICUS

Serum B was the only one that claimed to have antibodies for *Bacillus histolyticus*. The culture selected for the following tests was

TABLE VI—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN B AGAINST *BACILLUS HISTOLYTICUS*

Animal	Weight (lb)	Dose (cc)	Dose of serum	Lesion	Result
1	5	—	—	Typical	Dead 18 hrs
2	5	—	—	Typical	Dead 18 hrs
3	5	—	—	Typical	Dead 18 hrs
4	5	—	—	Typical	Dead 18 hrs
5	5	—	—	Typical	Dead 18 hrs
6	5	—	—	Typical	Dead 18 hrs
7	5	—	—	Typical	Dead 18 hrs
8	5	—	—	Typical	Dead 18 hrs
9	5	—	—	Typical	Dead 18 hrs
10	5	—	—	Typical	Dead 18 hrs
11	5	—	—	Typical	Dead 18 hrs
12	5	—	—	Typical	Dead 18 hrs
13	5	—	—	Typical	Dead 18 hrs
14	5	—	—	Typical	Dead 18 hrs
15	5	—	—	Typical	Dead 18 hrs
16	5	—	—	Typical	Dead 18 hrs
17	5	—	—	Typical	Dead 18 hrs
18	5	—	—	Typical	Dead 18 hrs
19	5	—	—	Typical	Dead 18 hrs
20	5	—	—	Typical	Dead 18 hrs
21	5	—	—	Typical	Dead 18 hrs
22	5	—	—	Typical	Dead 18 hrs
23	5	—	—	Typical	Dead 18 hrs
24	5	—	—	Typical	Dead 18 hrs
25	5	—	—	Typical	Dead 18 hrs
26	5	—	—	Typical	Dead 18 hrs
27	5	—	—	Typical	Dead 18 hrs
28	5	—	—	Typical	Dead 18 hrs
29	5	—	—	Typical	Dead 18 hrs
30	5	—	—	Typical	Dead 18 hrs
31	5	—	—	Typical	Dead 18 hrs
32	5	—	—	Typical	Dead 18 hrs
33	5	—	—	Typical	Dead 18 hrs
34	5	—	—	Typical	Dead 18 hrs
35	5	—	—	Typical	Dead 18 hrs
36	5	—	—	Typical	Dead 18 hrs
37	5	—	—	Typical	Dead 18 hrs
38	5	—	—	Typical	Dead 18 hrs
39	5	—	—	Typical	Dead 18 hrs
40	5	—	—	Typical	Dead 18 hrs
41	5	—	—	Typical	Dead 18 hrs
42	5	—	—	Typical	Dead 18 hrs
43	5	—	—	Typical	Dead 18 hrs
44	5	—	—	Typical	Dead 18 hrs
45	5	—	—	Typical	Dead 18 hrs
46	5	—	—	Typical	Dead 18 hrs
47	5	—	—	Typical	Dead 18 hrs
48	5	—	—	Typical	Dead 18 hrs
49	5	—	—	Typical	Dead 18 hrs
50	5	—	—	Typical	Dead 18 hrs
51	5	—	—	Typical	Dead 18 hrs
52	5	—	—	Typical	Dead 18 hrs
53	5	—	—	Typical	Dead 18 hrs
54	5	—	—	Typical	Dead 18 hrs
55	5	—	—	Typical	Dead 18 hrs
56	5	—	—	Typical	Dead 18 hrs
57	5	—	—	Typical	Dead 18 hrs
58	5	—	—	Typical	Dead 18 hrs
59	5	—	—	Typical	Dead 18 hrs
60	5	—	—	Typical	Dead 18 hrs
61	5	—	—	Typical	Dead 18 hrs
62	5	—	—	Typical	Dead 18 hrs
63	5	—	—	Typical	Dead 18 hrs
64	5	—	—	Typical	Dead 18 hrs
65	5	—	—	Typical	Dead 18 hrs
66	5	—	—	Typical	Dead 18 hrs
67	5	—	—	Typical	Dead 18 hrs
68	5	—	—	Typical	Dead 18 hrs
69	5	—	—	Typical	Dead 18 hrs
70	5	—	—	Typical	Dead 18 hrs
71	5	—	—	Typical	Dead 18 hrs
72	5	—	—	Typical	Dead 18 hrs
73	5	—	—	Typical	Dead 18 hrs
74	5	—	—	Typical	Dead 18 hrs
75	5	—	—	Typical	Dead 18 hrs
76	5	—	—	Typical	Dead 18 hrs
77	5	—	—	Typical	Dead 18 hrs
78	5	—	—	Typical	Dead 18 hrs
79	5	—	—	Typical	Dead 18 hrs
80	5	—	—	Typical	Dead 18 hrs
81	5	—	—	Typical	Dead 18 hrs
82	5	—	—	Typical	Dead 18 hrs
83	5	—	—	Typical	Dead 18 hrs
84	5	—	—	Typical	Dead 18 hrs
85	5	—	—	Typical	Dead 18 hrs
86	5	—	—	Typical	Dead 18 hrs
87	5	—	—	Typical	Dead 18 hrs
88	5	—	—	Typical	Dead 18 hrs
89	5	—	—	Typical	Dead 18 hrs
90	5	—	—	Typical	Dead 18 hrs
91	5	—	—	Typical	Dead 18 hrs
92	5	—	—	Typical	Dead 18 hrs
93	5	—	—	Typical	Dead 18 hrs
94	5	—	—	Typical	Dead 18 hrs
95	5	—	—	Typical	Dead 18 hrs
96	5	—	—	Typical	Dead 18 hrs
97	5	—	—	Typical	Dead 18 hrs
98	5	—	—	Typical	Dead 18 hrs
99	5	—	—	Typical	Dead 18 hrs
100	5	—	—	Typical	Dead 18 hrs

No. 12597 which was isolated in August 1940 from a culture submitted by Captain D. M. Johns from a fatal case of gaseous gangrene at Letterman General Hospital, San Francisco, California. The original culture was contaminated by *Bacillus porogenes* and *Micrococcus epidermidis*.

Experiment 1. December 9, 1941. A series of guinea pigs was injected subcutaneously with a pure culture of *Bacillus histolyticus* No. 12597 grown for 24 hours in a glucose meat broth medium. Two of these animals served as controls while 4 received also varying amounts of serum B simultaneously as shown in Table VI.

Table VI shows that serum B protected a guinea pig against at least 10 fatal doses of *Bacillus histolyticus* culture which was inoculated subcutaneously. The marginal animal showed a slight transient edema but there was no lysis.

Although guinea pigs inoculated with *Bacillus histolyticus* subcutaneously generally show a striking and peculiar denudation of skin at the site of inoculation they usually do not die. But both guinea pigs used as controls in this experiment did so.

Control 98 which received 1 cubic centimeter of culture showed at 15 hours an area 3 centimeters across completely denuded of skin and was obviously sick. It died at 16 hours at which time an area, by 11 centimeters was denuded but there was no perforation of the peritoneum and all of the viscera was normal in appearance. A culture from the heart's blood was sterile.

TABLE VII—PROTECTIVE ACTION OF GAS GANGRENE ANTITOXIN B AGAINST *BACILLUS SORDSELLII*

Animal	Weight (lb)	Dose (cc)	Dose of serum	Lesion	Result
1	5	—	—	Typical	Dead 18 hrs
2	5	—	—	Typical	Dead 18 hrs
3	5	—	—	Typical	Dead 18 hrs
4	5	—	—	Typical	Dead 18 hrs
5	5	—	—	Typical	Dead 18 hrs
6	5	—	—	Typical	Dead 18 hrs
7	5	—	—	Typical	Dead 18 hrs
8	5	—	—	Typical	Dead 18 hrs
9	5	—	—	Typical	Dead 18 hrs
10	5	—	—	Typical	Dead 18 hrs
11	5	—	—	Typical	Dead 18 hrs
12	5	—	—	Typical	Dead 18 hrs
13	5	—	—	Typical	Dead 18 hrs
14	5	—	—	Typical	Dead 18 hrs
15	5	—	—	Typical	Dead 18 hrs
16	5	—	—	Typical	Dead 18 hrs
17	5	—	—	Typical	Dead 18 hrs
18	5	—	—	Typical	Dead 18 hrs
19	5	—	—	Typical	Dead 18 hrs
20	5	—	—	Typical	Dead 18 hrs
21	5	—	—	Typical	Dead 18 hrs
22	5	—	—	Typical	Dead 18 hrs
23	5	—	—	Typical	Dead 18 hrs
24	5	—	—	Typical	Dead 18 hrs
25	5	—	—	Typical	Dead 18 hrs
26	5	—	—	Typical	Dead 18 hrs
27	5	—	—	Typical	Dead 18 hrs
28	5	—	—	Typical	Dead 18 hrs
29	5	—	—	Typical	Dead 18 hrs
30	5	—	—	Typical	Dead 18 hrs
31	5	—	—	Typical	Dead 18 hrs
32	5	—	—	Typical	Dead 18 hrs
33	5	—	—	Typical	Dead 18 hrs
34	5	—	—	Typical	Dead 18 hrs
35	5	—	—	Typical	Dead 18 hrs
36	5	—	—	Typical	Dead 18 hrs
37	5	—	—	Typical	Dead 18 hrs
38	5	—	—	Typical	Dead 18 hrs
39	5	—	—	Typical	Dead 18 hrs
40	5	—	—	Typical	Dead 18 hrs
41	5	—	—	Typical	Dead 18 hrs
42	5	—	—	Typical	Dead 18 hrs
43	5	—	—	Typical	Dead 18 hrs
44	5	—	—	Typical	Dead 18 hrs
45	5	—	—	Typical	Dead 18 hrs
46	5	—	—	Typical	Dead 18 hrs
47	5	—	—	Typical	Dead 18 hrs
48	5	—	—	Typical	Dead 18 hrs
49	5	—	—	Typical	Dead 18 hrs
50	5	—	—	Typical	Dead 18 hrs
51	5	—	—	Typical	Dead 18 hrs
52	5	—	—	Typical	Dead 18 hrs
53	5	—	—	Typical	Dead 18 hrs
54	5	—	—	Typical	Dead 18 hrs
55	5	—	—	Typical	Dead 18 hrs
56	5	—	—	Typical	Dead 18 hrs
57	5	—	—	Typical	Dead 18 hrs
58	5	—	—	Typical	Dead 18 hrs
59	5	—	—	Typical	Dead 18 hrs
60	5	—	—	Typical	Dead 18 hrs
61	5	—	—	Typical	Dead 18 hrs
62	5	—	—	Typical	Dead 18 hrs
63	5	—	—	Typical	Dead 18 hrs
64	5	—	—	Typical	Dead 18 hrs
65	5	—	—	Typical	Dead 18 hrs
66	5	—	—	Typical	Dead 18 hrs
67	5	—	—	Typical	Dead 18 hrs
68	5	—	—	Typical	Dead 18 hrs
69	5	—	—	Typical	Dead 18 hrs
70	5	—	—	Typical	Dead 18 hrs
71	5	—	—	Typical	Dead 18 hrs
72	5	—	—	Typical	Dead 18 hrs
73	5	—	—	Typical	Dead 18 hrs
74	5	—	—	Typical	Dead 18 hrs
75	5	—	—	Typical	Dead 18 hrs
76	5	—	—	Typical	Dead 18 hrs
77	5	—	—	Typical	Dead 18 hrs
78	5	—	—	Typical	Dead 18 hrs
79	5	—	—	Typical	Dead 18 hrs
80	5	—	—	Typical	Dead 18 hrs
81	5	—	—	Typical	Dead 18 hrs
82	5	—	—	Typical	Dead 18 hrs
83	5	—	—	Typical	Dead 18 hrs
84	5	—	—	Typical	Dead 18 hrs
85	5	—	—	Typical	Dead 18 hrs
86	5	—	—	Typical	Dead 18 hrs
87	5	—	—	Typical	Dead 18 hrs
88	5	—	—	Typical	Dead 18 hrs
89	5	—	—	Typical	Dead 18 hrs
90	5	—	—	Typical	Dead 18 hrs
91	5	—	—	Typical	Dead 18 hrs
92	5	—	—	Typical	Dead 18 hrs
93	5	—	—	Typical	Dead 18 hrs
94	5	—	—	Typical	Dead 18 hrs
95	5	—	—	Typical	Dead 18 hrs
96	5	—	—	Typical	Dead 18 hrs
97	5	—	—	Typical	Dead 18 hrs
98	5	—	—	Typical	Dead 18 hrs
99	5	—	—	Typical	Dead 18 hrs
100	5	—	—	Typical	Dead 18 hrs

Control 103 which received 0.1 cubic centimeter also showed at 15 hours an area about 3 centimeters across denuded of skin but this animal was apparently not sick. However at 40 hours it was found dead with an abdominal perforation and its intestines hanging out which is common in animals receiving intramuscular injections of *Bacillus histolyticus*. The *Bacillus histolyticus* was recovered from the heart's blood.

Guinea pigs Nos. 101 and 109 both developed large areas (6 by 10 cm.) of denudation without perforation at death. Cultures from the heart's blood were negative in both cases.

PRELIMINARY EXPERIMENTS ON *BACILLUS SORDSELLII*

Serum B was the only serum claiming to have antibodies for *Bacillus sordellii*.

Experiment 13. For this experiment my strain No. 1316 was selected. This strain was received in 1927 from Dr. Frank L. Meleney of Presbyterian Hospital, New York, as *C. edematoides* No. 1 isolated from patient (10). Its identity with the previously named *Bacillus sordellii* was shown both by Humphreys and Meleney (8) and by Hall, Jungherr and Rymer (6, 7).

Five guinea pigs were inoculated subcutaneously with a 48 hour meat broth culture as indicated in Table VII.

Table VII shows that 1 cubic centimeter of serum B protected a large guinea pig against at least 1000 fatal doses of *Bacillus sordellii* culture. This animal showed only a slight transient edema.

STUDY OF THE LATE SYMPTOMS OF CASES OF IMMERSION FOOT

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DURING the early part of February 1943 there were admitted to the hospital at this post a number of patients with immersion foot incurred as a result of the sinking of the patients transport. The condition varied from mild to severe and the patients were treated in two main groups as follows. In the first group the legs were exposed to fairly cool air under cradles. In the second group the legs were wrapped loosely in sterile cotton. Both groups were further treated by bed rest.

A small third group made up mainly of civilians, contractors, employees and merchant mariners whose going and coming in the hospital could not be completely controlled due to the large number of cases and general confusion, undertook a type of treatment of their own, namely Finnish type steam bath. The patients made a much more rapid clearing of local and general symptoms than did the group treated with bed rest and cooling. It is felt that this type of treatment should have further investigation.

After the discharge to duty of the Army patients and as time went on it was noticed that a number were having persistent symptoms referable to their lower extremities. This persistent symptom was noticed first among mess personnel in the hospital whose duty required long periods of standing on their feet. Inquiry then showed (about 14 months after onset) that a considerable number of the men who were on the sunken boat whether they had been hospital patients at the original onset or not and who were still on duty at this post had persistent complaints of one type or another referable to their lower extremities.

It was then determined to carry out the present study of personnel remaining at the post at the present time with the following findings:

General. Of the 63 persons remaining at this post in April 1944 14 months after the sinking it was found that 49 or 77 per cent of the total group had complaints referable to their lower extremities and that of these 49 patients examined 42 had abnormal physical findings in their legs or feet which was 64 per cent of the total group remaining or 83 per cent of those presenting complaints.

These men were of various communities and enlisted grades and all branches of service in the Army. Their ages varied from 20 to 35 years with an average age of 34. Their previous civilian occupations and places of residence in the United States were inquired into and neither was found to be a factor in the present study.

Previous medical history. A check of the previous medical history revealed nothing in any of these patients that was a factor in their present complaints. There were 6 old injuries to lower extremities but none of these were considered a factor in the present complaint.

Experience at the time of sinking. A study was made of the experiences at the time of the immersion in order to determine the various factors which might throw some light on the present complaints. Inquiry was made as to the question of injury at the time of sinking and 9 were found to have received minor injuries at that time none of which were considered to be factors in their present complaints.

All 63 men had their legs more or less in the water following the sinking either in the sea or in lifeboats partially filled with water or in rafts partially filled with water.

The legs were in the water in this manner from 1 to 60 hours with an average time of 3 1/2 hours. The water temperature varied from 28 to 36 degrees evidently depending on whether or not the men were in the Gulf Stream.

An attempt was made to determine how these men were clothed particularly with reference to their lower extremities in order to see how such clothing might affect their original condition and follow up results. The largest group was wearing government issue clothes with ordinary government issue shoes and light woolen socks. There were 26 in this group, 4 of them had complaints and 19 showed abnormal physical findings. In the next group made up of Air Force enlisted men, high leather boots and heavy woolen socks were worn. There were 7 of these men, all 7 had complaints and 4 showed abnormal physical findings. In another group made up of men in light wool socks only were worn, all had abnormal complaints and physical findings. In another group of 5 men, government issue shoes only were worn and all had complaints and abnormal physical findings. The 2 men remaining did not recall what clothing they had on their lower extremities while in the water, both had complaints and abnormal physical findings.

No deduction can be made as to the benefit any particular type of clothing for the lower extremities would afford under the circumstances as they existed.

Of 51 men checked, the effect of the cold immersion was so marked that in getting aboard the Coast Guard boats picking up survivors, 38 of them needed assistance and were hauled up on the boats by ropes. Only 13 were able to get into the rescuing boats unaided and it is notable that of these 13, 8 were in a lifeboat with water only up to their knees for a period of 3 hours. The rest of the men who did not need assistance were either in the sea or practically submerged on rafts for a period of 4 to 5 hours. Of this group who did not require assistance in getting aboard the rescuing boats, 9 had symptoms at the time of examination and 7 had abnormal physical findings. All the men who needed assistance in getting on board the rescuing boats complained mainly of numbness or lack of coordination in their legs so that they had difficulty in walking and the treatment on the boats consisted in the removal of wet clothes, rub downs, hot drinks and general warmth.

Of the total group examined, 1 were admitted to the hospital for treatment after their arrival. They had immersion foot of varying degrees and the length of treatment varied from 1 to 17 days with an average stay of 6½ days.

Subsequent treatment. During the 14 months since the original onset, only 1 man of the whole group was admitted to the hospital for symptoms referable to the secondary effect of immersion foot.

Eleven men came to sick call of this group at varying periods during the 14 months; the average number of visits to sick call being 1 to 5 and the main complaint being pains in the leg, usually treated by physiotherapy.

Present symptoms. At the present time the following are the complaints presented by the group still under treatment:

Burning sensation or burning pain in the feet or legs while walking. Twenty-two men complained of this in varying degrees. A large number of the group had the symptom in mild form and thought nothing much about it until the complaint was elicited by question. In a very few it was a marked complaint.

Numbness of the legs. This was one of the main complaints and existed in 7 of the group examined. It was of varying degree, mainly existing at rest and particularly at night in bed in conjunction with rest pain.

Intermittent claudication. True intermittent claudication to the extent that the patient needed to stop and rest after walking a short distance due to calf cramps existed in only 8 and was quite severe in degree. Of the form of intermittent claudication known as *forme fruste*, characterized by weakness of the leg muscles on walking a short distance and requiring stopping to rest before going on, there were found 25 complaints. Of the form of intermittent claudication characterized by pain in the buttocks and legs, simulating sciatica, there were 4.

Rest pain. This was found as the most common and severe complaint of the group examined. It was found in 30 of the group and was characterized mainly either by cramp-like muscle pains or general aching of the lower extremities occurring at night while the patient was in bed and associated with numb

TERATOMA OF THE OVARY

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TERATOMA of the ovary otherwise known as teratoblastoma, embryoma or solid dermoid has been of surpassing interest to pathologists since early days. This has been true not merely because of its rarity and because its derivation has remained obscure but particularly because a more complete understanding of these remarkable tumors may be the key which will serve to explain the nature of other rare ovarian growths.

Although encountered in other organs and tissues of the body, teratoma is predominantly an ovarian tumor and it is here that it is found in most developed and characteristic form. It is usually a compact solid rapidly growing neoplasm composed of tissues which are frequently wholly undifferentiated or responding to various stages of fetal development and revealing only isolated tendency to more completely developed organ-like formation. The material entering into the structure of dermoids and teratomas is the same—all three germinal layers represented in both the difference lies apparently in the tissue of origin and in the fact that dermoids are comprised of mature tissues whereas a teratoma consists of embryonal elements. The great characteristic of teratoma is the loss of proportion in its structure. There is topographical confusion.

Opinions differ in judgment of the malignancy of teratoma; it is a growth characterized by capacity for great proliferation not ascribable to carcinomatous or sarcomatous degeneration but an inherent property of the cell which constitute it. Therefore it is to be regarded as potentially malignant in all cases unquestionably malignant in most instances.

The tumor is usually nodular or lobulated often with projecting cysts of astonishingly large size for so malignant a neoplasm (due to rapid growth?) often the size of a man's head. It may be spherical, ovoid or of ovarian shape, is usually pedunculated as in our case of

varied color—gray, yellow, red, blue, brown. The consistency is usually soft but may be firm. This feature varies not only with various tumors but also in the same growth, being marrow soft to firmly elastic. A capsule is usually present but may not be clearly defined. Perforation of the capsule is frequent but this does not mean usual. The cut surface reveals a multitude of variations. It is polymorphous, polychromic. Cystic spaces are of various sizes and the contents may be clear, limy, geloid, fatty, honeycombed or purulent. The color may be gray, straw, yellow, pinheaded black, points or homogeneous or hemorrhagic, red, brown tissue in solid, lamellated, brain-like or marrow-like masses. Strands of dense fibrous tissue are usual. Areas ranging from larger portions of organs or viscera (rare) to minute microscopic rudiments may be found.

Microscopically the picture is that of cancer. The tissues are mostly fetal in character but not entirely and invariably so. It is characteristic for well-differentiated tissues to be immediately adjacent to lawless and wild areas of potentially or definitely malignant epithelial, endothelial or arcomatous pattern.

One element of a teratoma may appear in growth of the other. Such one-sided development is unusual yet it presents the very important question as to how far apparently simple tumors of the ovary may be of teratomatous origin.

It is difficult to gauge the number of these growths which have been discussed in the literature since the days of Virchow, perhaps 50 to 300 all told. In Kermanner's clinic in Vienna among 1300 ovarian tumors throughout a period of 30 years only were teratomas. Intermediate or transition forms between dermoid cysts and teratomas occur rarely if ever, probably there are some.

Metastases occur most often in the abdomen but may appear in distant parts of the body. They present either a counterpart of the original tumor or a more simple structure, i.e., a purely sarcomatous or carcinomatous growth.



T T m f y

a lial tumor a chorioepithelioma or a malignant tumor of undifferentiated cell

Teratoma: a tumor of childhood and early maturity mostly before the age of 35. Not more than 5 recorded cases have been found after the menopause.

The etiology of teratoma remains unsolved. The growth must be derived from a cell that can produce all three embryonic layers as expressed by Askanazy; the origin must be from a totipotent cell. Only two theories of origin are prevalent that isolated blastomeres (Marchand Bonnet theory) are the source of these trigeminal growths or that they arise from primitive unfertilized ova.

Our tumor was removed from a woman of 63, the mother of 4 healthy children. Her father and one brother died of carcinoma. Three years earlier there had been some genital bleeding and vaginal removal of a fibroid tumor and polyps; no malignancy was found. At the time of our examination the patient complained of vaginal burning without discharge and a tumorous enlargement of the abdomen. There were no symptoms or evidences of endocrine abnormality.

At operation February 6, 1945, the liver was firmly and inseparably adherent to the anterior abdominal wall; the pancreas was indurated; the upper abdomen otherwise negative. There were some adhesions about the cecum. The left ovary was converted into a freely movable pedunculated irregularly nodular massive tumor with a smoothly lobulated external surface. The right ovary was atro-

phic. The generous sized uterus contained one small interstitial myoma and one bean sized sessile polyp; the endometrium was rather thick for an elderly woman.

The irregularly nodular smoothly lobulated 14 by 9 by 6 centimeter tumor represented the left ovary (Fig. 1). The outline was roughly triangular in shape; one surface strand demarcating the mass into a major giant kidney sized and a minor asymmetrical orange sized smaller lobe. Some of the lobules projected from the surface as firm nodules up to 4 centimeters in diameter. The entire surface was firm except over one tenth of its area which was cystic. The color of the fresh specimen varied from bluish to reddish gray.

On bisection the surface presented a solid apparently malignant tumor with numerous cystic cavities up to 3 centimeters in diameter variously filled with clear turbid slimy colloid or hemorrhagic fluid and a varied amount of necrotic debris. Some of the solid cut surface was fibrotic and firm but the major portion was of the consistency of a parenchymatous organ such as the liver or kidney; the color greatly varied from pink to gray brown; a kidney brown color predominant. Many pinhead to pinpoint black spots were visible. Trabeculations of the stroma were clearly evident.

The microscopic picture verifies Askanazy's emphasis that often the constituents cannot be distinguished as was evidenced by the long confusing discussion of the distinguished pathologists during the conference at which he



F Ph t m ograph f t f a f t h t t m

presided. No portions of organs such as are sometimes illustrated are present in our specimen thus evidencing the embryonal nature of this growth. It is a true blastoma. A variety of cellular structure is evident in amazing detail and with great clarity in contrast with all illustrations which have been available to me in the literature. Organoid forms are suggested but surely not to be undeniably identified as such. In Figure a are tubules resembling glands along the intestinal tract. Figure c presents epithelial configurations of medullary tube like structures. Figure e reveals a mesonephroid type of tubule not unlike those of arrhenoblastoma. Massive islands of epithelial cells such as in Figure 2 b but often of much greater size dominate the field in the majority of microscopic sections. Masses of immature cells such as those in 11,

ure d and extensive wildly grown sarcoma like and carcinoma like areas in abundance appear under the microscope adjacent to well differentiated island of cells such as those of Figure b.

The more one studies the polymorphous microscopic picture presented by this tumor the greater the temptation to join the ranks of those who ascribe a teratomatous origin to many rare kind of tumors of the ovary. This statement does not gainsay the evident origin of Brenner tumor and some pseudomucinous cystadenomata from the peritoneal epithelium of the uterine adnexa.

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ONE STAGE OPEN RESECTION OF LESIONS OF THE LEFT COLON WITHOUT COMPLEMENTARY COLOSTOMY

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DONALD D. KOZOLL, M.D., Ch.C. III

COLON resection has gone through a process of evolution that will prove to be nothing short of remarkable for the half century in which it has been performed. The earlier procedures consisted of primary anastomosis of the open colon with such disastrous mortality from peritonitis that the contribution of Mikulicz (12-13) in 1903 was widely accepted as the procedure of choice when he reported a 16.6 per cent mortality for 24 patients operated upon by the principle of exteriorization. Mikulicz was not the originator of this plan of resection, but his relatively large series of cases was so convincing that the procedure has been identified with his name. The Rankin obstructive resection (1930) was an improvement, but even at that time Rankin recognized the desirability of a primary resection, but deterred because he did not think it could be done safely.

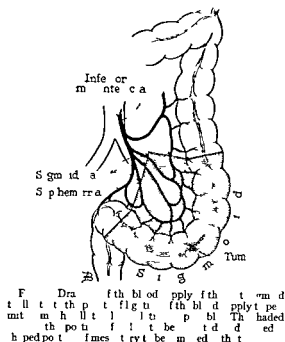
The next phase in this development was the performance of one stage ileocolostomies with resection of lesions of the right half of the colon. A few surgeons doubted the safety of this plan as evidenced by Allen's recommendation of a transverse ileocolostomy preceding resection of the right colon (1-2) the use by Whipple (20-21) of the Miller-Abbott tube as complementary decompression and the isolated position of Lahey in insisting upon exteriorization procedures for ileocolostomy. By and large this procedure as a one stage operation has been so successful in the hands of so many surgeons that little argument can now be raised as to its safety.

The next development consisted of primary resection and anastomosis of a colonic lesion with a complementary appendicostomy, cecostomy (10) or colostomy, as recommended by

Wilkie, Allen (1), Whipple (5), Cheever, Dixon (6), Stone and McLanahan and White. In the hands of those insisting upon this auxiliary vent the mortality rate decreased one half or more when this feature was added. Dixon (5) must be credited with the extension of this procedure to lesions of the pelvic colon, but always concluded his operation with a transverse colostomy which was closed 3 to 6 weeks later.

The most recent development has been in the execution of a one stage resection and anastomosis without the proximal vent. Cheever and Stone and McLanahan were discouraged by the higher mortality rate attendant upon this method, but Campbell did not find that the creation of the external vent was essential. In what perhaps represents the most thorough presentation of this subject to date, Wangenstein (19) reported favorably upon 61 patients operated upon by this plan with an overall mortality of 16.6 per cent, although 1 patient was given a proximal appendicostomy, 2 had cecostomies and 6 came to operation with previous colostomies performed for relief of obstruction. Wangenstein, however, makes an issue of the importance of a closed method of anastomosis using a clamp technique and theoretically attaining asepsis.

We should like to give a preliminary report of our first 20 operations from the private surgical service of one of us (K.A.M.) performed during the past 2 years using an open method of anastomosis. Though the period of observation is short and the series of cases limited, we believe that the trend has been clearly indicated. We were encouraged to attempt this plan of treatment by the availability of such modern adjuncts to bowel surgery as succinyl ulfathiazole, multiple blood transfusions, fluid and electrolyte balance, parenteral sulfonamides, spinal anesthesia, oxygen inhalation, intestinal decom-



pression and the use of the interrupted permanent sutures. We have thus witnessed a phenomenon in which the cycle of development returns to its very start but the improvements which have occurred in the interim have turned an earlier failure into a success.

CLINICAL DATA

Age and sex. The 20 cases were evenly divided as to sex and the range was from 39 to 77 years with an average of 64 years. Age or sex did not influence our preoperative or postoperative management although the only 2 instances in which we used an inhalant anesthetic were nervous females who insisted upon being unconscious. The occurrence of atelectasis, embolism and edema was seen postoperatively only in patients past 70 years of age of whom there were 4. Metastases of the primary lesion were seen more frequently

struction and succinylsulfathiazole therapy was omitted. None of our patients in this group presented the picture of colon obstruction for obviously they were not candidates for the type of surgery contemplated here. The proctoscopic examination became even more important here for the recognition of the distance between the pectinate line of the rectum and the lower limit of the lesion is of importance in the decision as to whether the patient will be best treated by an abdominal perineal resection or a procedure which will preserve the rectal sphincter. Wan ensteen (19) has shown that lesions 13 centimeters above the pectinate line are resected and anastomosed with much greater ease but does not hesitate to do an ampullary resection for a lesion within 10 centimeters of the pectinate line. Dixon (5) on the other hand has not reported resections below the level of the rectosigmoid.

Succinylsulfathiazole. This drug was administered to all but 2 patients for a period of 7 to 14 days before surgery in doses varying from 12 to 18 grams per day. The usual routine for administration of the drug was for the patient to take the drug at home in the prescribed dose after catharsis, cleansing and low residue diet and to continue until entrance to the hospital. At this time an enema and castor oil (1 ounce) were repeated and the drug continued until the time of the operation. No further enemas were administered especially during the 24 hours immediately preceding operation. When the latter precaution is not taken an occasional patient will show enema fluid proximal to the lesion which can be a source of peritoneal soiling in an open anas-

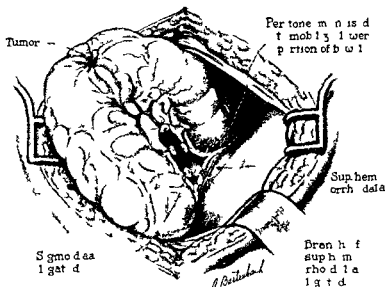


Fig. 1. Tumor of the sigmoid colon. The tumor is shown in the center of the illustration, with the colon and its associated vessels and nerves. The right side of the colon is labeled 'Sigmoid' and 'Ileocecal'. The left side is labeled 'Suprahemorrhoidal' and 'Distal'. The illustration is signed 'A. B. B. B.' in the lower right corner.

five days. The 2 patients who inadvertently did not receive succinylsulfathiazole were those with incorrect diagnoses. Resections were performed successfully in both of these with out complications.

Blood transfusions. The average amount of blood transfused in this group of patients was 1,350 cubic centimeters and varied from 500 to 3,500 cubic centimeters. Since we were dealing with private patients, the need for massive transfusions was probably not as great as we have seen in patients from our charity wards who enter the hospital in a later stage of the disease are more apt to show anemia and present a more profound nutritional problem. When more than one transfusion was necessary we preferred to give it one or more days preoperatively so that its effects would become more manifest. Although no amino acids were used in this group of patients we have already reported its use in other cases and are well aware of its potentialities (11).

Operative procedure. In 18 of the 20 patients spinal anesthesia was used. In 2 of the 18 pon tocaïne was used. In the remainder a 1:500

solution of nupercaine with the technique of Hand and Sise. In 2 patients in which an inhalant was deemed advisable combinations of ether and ethylene and ether with cyclopropane were used. Our only death was in the patient receiving ether and ethylene.

The duration of the operation varied from 1 hour and 10 minutes to 2 hours and 40 minutes with an average of 1 hour and 45 minutes.

The details of the operative technique are shown in Figures 1 to 4. It should be mentioned that no crushing clamps were used. Interrupted catgut sutures were used through all layers and interrupted No. 35 stainless steel wire sutures were placed as a second seromuscular layer. The latter were used as Lembert sutures. Sulfanilamide crystals in quantities up to 5 grams were sprinkled between the first and second rows of sutures and about the anastomosis itself. At the conclusion of the operation the rectal sphincter was dilated and a rectal tube was inserted to a point below the level of resection.

Pathology. The size of the lesions varied from involvement of a 1.5 centimeter segment

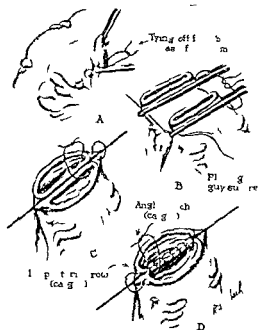


Fig 3 A Th l p p df t m bylee g
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t h l d th d t l d p um l loop t g th I C the
pl m t t f gl t t hes d m t d h h the
t t d d f m th m l urf f e l p
b ght t t h th f th ppo t l p d
m g d t th m sal f f th lloop thek t th
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m t f f t r r p t catout t es rpo t g
ll j th fir tpo t

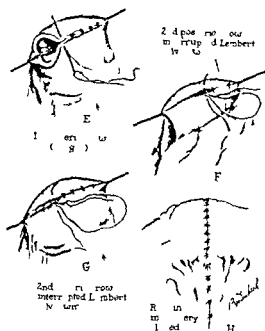


Fig 4 E Th t t g f the first f t
th t r f e t g f t rupt d c t g t t
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rupt d t g u t Th b l th t m d t h b d
m l ca ty d th d l s e d l a y Th f t
h l d b m p h i z e d t h a m p l m t y l t y
h b e m p l j e d t h f s e s h h h
po ted

of bowel wall to a 14 centimeter segment. The sigmoid colon was the site of the lesion in 11 cases, the transverse colon and splenic flexure in 1 case each, the descending colon in 4, and the rectum in 3. The lowest lying lesion in the series was 5 to 6 centimeters up from the anorectal juncture, and the lesion histologically proved to be a lipoma. Fifteen of the lesions were adenocarcinomas, either papillary, mucoid or annular in type. One case was that of a stercoraceous ulcer due to an impacted fecalith, and the remaining one was the aforementioned lipoma. In 5 patients the regional mesenteric lymph nodes contained metastases, while in another 5 cases the enlarged nodes proved to be inflammatory in nature. Omental nodes were present in 1 patient, liver metastases in another, and ovary metastases in another.

Postoperative course. All patients were placed after operation on continuous siphon, and parenteral fluid were administered in quantities necessary to maintain fluid balance and good urine output, and hyperventilation was obtained with mixtures of oxygen and carbon dioxide. Although peak rectal temperatures to 104 degrees Fahrenheit were seen occasionally, these were the exceptions. In most patients a remarkably afebrile course was characteristic after the second or third postoperative day. Gastric suction was discontinued as soon as the patient first passed flatus, which was usually on the 3rd or 4th postoperative day. Oral feeding was usually started on the same day. In 6 patients the first formed stool was passed on the 3d postoperative day, in 1 on the 4th, in 5 on the 5th.

in another 5 on the 6th in 2 on the 7th and in the remaining patient on the 10th postoperative day. The early return of bowel function was unassociated with diarrhea or bleeding except in 1 patient who later proved to have a non specific ulcerative colitis. When there was a delay in bowel function without evidence of organic obstruction patients were given protriptyline in repeated doses.

The period of postoperative hospital stay averaged 13 days and ordinarily ranged between 10 and 15 days. The patient who had the ulcerative colitis remained in the hospital 49 days.

Complications. Pulmonary atelectasis occurred in 2 patients, pulmonary edema in 1 and pulmonary embolism in 1. All of the patients were 40 years of age or older. A wound infection which required readmission for drainage occurred in 1 patient. A urethritis in 1 patient followed repeated catheterization. In 1 a nonspecific ulcerative colitis became apparent during the postoperative course. There was 1 death (the case of embolism) which occurred on the third postoperative day, giving a mortality of 5 per cent.¹

DISCUSSION

Orthodox teaching had heretofore condemned any attempt to resect anastomose and return the colon to the peritoneal cavity on the following ground:

1. The blood supply of the colon is too poor to depend upon satisfactory healing, i.e. a leak at the anastomosis is far more imminent than in an anastomosis higher in the gastrointestinal tract.

2. The high bacterial flora of the colon could not be adequately controlled by enemas alone and peritonitis and wound infection were considered inevitable sequelae.

3. Postoperative distention would jeopardize healing at the suture line by increasing intraluminal tension.

With the advent of modern preoperative and postoperative care this concept requires re-evaluation.

Better anatomical appreciation of the blood supply of the colon has taught us that a pri-

mary anastomosis can be done if we stay within the boundary of the marginal branches of the left colonic sigmoidal and superior hemorrhoidal arteries as the case requires, i.e. if care is shown in the ligation of vessel so that only the branches to be resected with the specimen are ligated and the mesentery is left intact to within a centimeter of the line of resection. Dixon (5) has pointed out that the middle and inferior hemorrhoidal arteries supply the pelvic colon so freely that branches of the superior hemorrhoidal arteries or even the terminal branches of the sigmoidal arteries can be ligated without fear of necrosis of an anastomosis of the colon beneath the brim of the true pelvis. He has also pointed out that a free anastomosis occurs between the superior middle and inferior hemorrhoidal arteries than is commonly appreciated. Singleton in pointing out several anatomical principles in surgery of the colon has emphasized freeing a minimum amount of mesentery, removing more of the antimesenteric border of the bowel than of the mesenteric side and utilizing the appendices epiploicae when possible. When it is necessary to remove the epiploic fat, Singleton cautions one not to ligate the artery entering the bowel at that point.

Many of us have gone through more than one era of new instruments and one wonders whether a crushing instrument does not have less place in primary surgery of the colon than elsewhere in the gastrointestinal tract. Whatever advantage may be gained by the so called aseptic anastomosis or closed technique is paid for at the price of crushed bowel edges which the colon will tolerate much more poorly than will the stomach or small bowel. We feel that peritonitis due to soiling at the time of anastomosis is no longer a major threat to bowel surgery with the protection afforded by the sulfonamides and still newer chemotherapeutic drugs which promise to attack even the gram negative bacilli. As Collier has pointed out the more serious form of peritonitis occurs from a continuous leak of intestinal content through a faulty anastomosis and not from soiling at the time of resection. Our attitude is that a crushing clamp predisposes to necrosis which may slough many days later.

The single most important contribution that encouraged us in this plan of therapy is the availability of succinyl sulfathiazole even though we went ahead with a primary resection in patients who inadvertently did not receive any of the drug preoperatively. Not only does this drug effectively reduce the coliform count of the stool (14) but its effect upon stool size and constancy is a favorable one. The combination of succinyl sulfathiazole in the colon and sulfanilamide in the peritoneum was unassociated with a single instance of peritonitis and only one of wound infection. This would appear to be significant. Some improvement in the clinical administration of the drug is possible such as giving the patient a 3 gram tablet instead of the 0.5 gram tablet. Sulfathalidin (phthalylsulfathiazole) which is believed to be just as effective as succinylsulfathiazole requires one half the dose of the latter and offers some advantage. We have dispensed with the initial administration of the 4 hour dosage and feel that the lower attainment of the desired level is less apt to produce diarrhea. Instead of calculating the dose on the basis of 4 gram per kilogram of body weight we have arbitrarily ordered the drug in doses of 1 and 18 grams per day depending upon the body weight. In the majority of the cases we did not resume succinyl sulfathiazole postoperatively for all of our patients were routinely treated with Levine tube gastric suction siphonage after operation. Sodium sulfadiazine was given intravenously in 5 gram doses on the first and second postoperative days as a routine.

The importance of blood transfusions cannot be overemphasized. In addition to restoring or increasing the circulating volume correcting an anemia that might be masked by dehydration elevating the circulating plasma proteins preventing shock sparing tissue protein for use elsewhere and contributing many factors concerned in the body's resistance to infection it offers one more as yet unexplored possibility. With the increased number of erythrocytes there is an increased oxygen capacity of the blood which should aid in maintaining the viability of a tissue the blood supply of which is limited. Adequate blood transfusion by increasing the protein content

of the body favorably affect wound healing gastrointestinal motility edema of the anastomotic stoma and obviate pulmonary complications. Time is necessary for the achievement of all these benefits and therefore transfusions should be given over a period of several days prior to operation. The infrequent occurrence of shock and its transitory nature (when it does occur) striking in the patients given sufficient blood prior to surgery.

Unless there is obstruction prior to operation in which event the patient is certainly not a candidate for primary resection postoperative distention can be prevented with a well functioning intragastric tube. We have learned from Wan Ensteen (18) that 80 per cent or more of intestinal gas swallowed atmospheric air and evacuation of this air before it can enter the small and large bowel becomes an effective therapeutic plan. Although the passage of a Miller Abbott tube might offer theoretical advantage in having the decompression closer to the site of anastomosis and in utilizing the remainder of the gastrointestinal tract proximal to the suction holes for absorption of fluids and calories the passage of this tube requires considerable effort and technical skill so that it is usually reserved for the obstructed patient. Further experience has shown us that the ileocecal sphincter not infrequently resists entrance of the balloon of the Miller Abbott tube and its actual progression to the left half of the colon is arrested. The passage of the Levine tube which we prefer should be carried out before operation so that the aspiration of any swallowed inhaled anesthetics if a general anesthetic is required will eliminate another cause of postoperative distention. Such a tube may prevent an aspiration pneumonia which can follow any anesthetic. The practice of preventing increased intracolonic pressures by passing a rectal tube proximal to the anastomosis (19) not carried out without trauma and should be done with caution. We have aided decompression by dilating the rectal sphincter by digital means and inserting a rectal tube but not to the level of the suture line.

The use of interrupted sutures has an unquestionable advantage. With the use of such sutures too much faith is not placed upon a

sin le strand and the circumference of the lumen is not encroached upon. Use of fine stainless steel wire as an interrupted seromuscular suture avoids the capillary attraction of exudate through strands of catgut or silk and therefore is less apt to create a sinus through which infection might drain. A permanent suture is a safeguard against a delayed separation when catgut begins to weaken and dissolve. The use of a Lembert suture has given us very satisfactory inversion without creation of a diaphragm which is more apt to follow the use of a thick row of several sutures. Similarly the use of interrupted steel wire in the closure of the wound (8) not only lowers the incidence of wound infection but permits these patients to get out of bed earlier and thus tends to avoid the pulmonary complications that go along with prolonged bed rest. The closure of the resected mesentery with fine sutures which avoid inclusion of important blood vessels is still another important detail.

Our preference for spinal anesthesia is based upon excellent relaxation, a quiescent gastrointestinal tract and reduced likelihood for emesis or tracheal aspiration after operation. The duration of anesthesia provided by nupercaine (7) 1,500 or pontocaine has always been adequate. We have given general anesthetics only on the insistence of the patient.

Thus far we have discussed only why primary resection and anastomosis of the left half of the colon could be performed as safely without a proximal vent or safety valve as with it we have said nothing of its *adantages* of which there are many. First and foremost a more radical resection is possible for more dissection can be done for the purpose of removal and less for the purpose of developing a proximal and distal loop for the exteriorized segment. Implants at the site of a former obstructive resection have not been unusual and one wonders if this recurrence could not have been avoided if the segment had been resected instead of placed as a septal pur

Second exteriorization operations show a high incidence of complications among which are retraction of either or both loops, wound infection, herniation, prolapse, fecal fistula, obstruction and stricture formation. All of

these add to an overall mortality and morbidity.

Third a temporary colostomy should be avoided if there is an alternate procedure that guarantees as low a mortality and as successful a result. Our mortality of 5 per cent is acceptably low, especially since pulmonary embolism takes its toll in spite of our best preventive efforts. If the mortality of subsequent closure of a colostomy is added to that of the initial procedure the comparison will favor the procedure we have recommended.

The fourth point is that of economy. An average 13 day postoperative course is possibly a new low for this type of procedure. Avoidance of further return visits to hospital for closure of colostomies or correction of complications has considerable practical merit.

In spite of the many advantages there are contraindications for this procedure. Obviously a patient with a distended colon due to obstruction is not a candidate for any type of resection and only a preliminary decompression colostomy should be done. Earlier diagnosis of lesions of the left half of the colon which are more prone to produce obstruction than in the right half of the colon and are within the reach of the proctoscope and sigmoidoscope in the majority of instances will spare more patients this complication. If the lesion has perforated and produced a fistula, abscess or peritonitis a one stage resection would be ill advised. Lesions which lie below the 10 centimeter level should be accurately appraised for size, fixation and regional extension because of the increased technical difficulties of an anastomosis at this level. No compromise should be made with the principle of a radical removal of all lymph bearing tissue for our first consideration should always be eradication of the carcinoma and our second consideration preservation of sphincter function. In obese patients with a short fat mesentery there may be difficulty in approximation of resected loops without tension.

SUMMARY

1. A preliminary report of 60 cases of one stage resection of the left half of the colon by an open technique is reported in which there was a mortality of 5 per cent.

2 Requirements which must be satisfied before this procedure is undertaken include succinylcholine adequate blood transfusions and/or amino acid therapy intragastric suction siphonage oxygen inhalation an anesthetic agent with a quieting effect upon the gastrointestinal tract and use of fine permanent interrupted sutures in bowel and wound

3 The advantages of the one stage resection without complementary colostomy include (1) more radical resection of the tumor (2) obviation of complications inherent in exteriorization procedures (3) avoidance of a colostomy and (4) shortened postoperative course and fewer readmissions

4 This procedure should not be tried in presence of a distended colon in lesions fixed close to pectinate line of rectum in presence of infection and in a patient with a short ileum

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TRANSURETHRAL RESECTION FOR PROSTATIC HYPERTROPHIES OF LARGE SIZE

REED M NESBIT MD FACS An Arbo Mich g n

DURING the years 1942-1943 and 1944 operations for the relief of prostatic obstruction were performed upon 1150 patients by my associates and myself at the University of Michigan Hospital. A detailed clinical analysis has been made of this entire series of cases and is being reported elsewhere. Ninety-six per cent of the patients were operated upon by transurethral resection while 2 per cent had perineal prostaticotomy and 2 per cent were treated by suprapubic enucleation. Among the 1104 patients who had transurethral resection 16 were found by tissue examination to have cancer of the prostate while 942, 85.4 per cent, had benign lesions and of the latter there were 176 who had glands of large size, i.e., 50 grams or more of tissue was removed at operation, and this group of cases comprises the basis for the present report.

The youngest patient was 48 years old and the oldest was 88 while the average age of the entire group was 69.8 years. The amounts of tissue removed are particularized in Table I.

The operating time in all of these cases was less than 1 hour, save in 3 or 4 instances in which the operation was concluded in 65 to 70 minutes. It has been our belief that longer operation time subjects the patient to a disproportionate risk of shock, so we have followed the practice of limiting the operating time to 1 hour and when removal of the adenomatous mass has been manifestly inadequate an early reoperation is carried out when the condition of the patient permits its safe performance. Secondary resection has invariably been well tolerated and none of the 5 patients who required two stage resections in this group of cases suffered from shock or other adverse clinical manifestations at the time of secondary resection. The average amount of tissue removed was 76.4 grams. In 2 cases 160

grams of tissue was removed in one operation and in one case 190 grams was removed in a two stage resection.

Blood loss determinations were made in 154 of the cases and are listed in Table II. It is the belief of the writer that hemorrhage constitutes one of the greatest hazards of the resection operation and that immediate estimation of operative blood losses should be carried out routinely and when excessive losses are observed transfusions of whole blood should be administered even though there are no objective signs of shock or impending shock. Forty-one of the patients were given postoperative blood transfusion. It has been our practice when operating upon patients who have very large glands in whom great loss of blood is anticipated to start a transfusion of blood at the beginning of operation so that the expected loss can be simultaneously replaced. Blood transfusions were administered during operation to 5 of the patients in this group.

The smallest blood loss in this group of patients is 5 cubic centimeters and the largest 1000 cubic centimeters which occurred in 2 cases. The average blood loss was 9 cubic centimeters. Postoperative hemostasis carried out by using the resectoscope was necessary in 6 cases.

A radio tube type of generator was used in all of these cases for the production of the cutting current and a damped current generated

TABLE I —CLINICAL DATA ON LARGE
BENIGN HYPERTROPHY CASES—1942-43-44

Gram	C
5 — 69	93
— 89	4
90 — 9	5
— 49	
5 — d O	5
T tal caes	76
A g m t f t s m d	76.4 g am
L g t m t— m d	
pe t	60 g m (es)
La gest m t— mo d	
p t	90 gram

TABLE II—OPERATIVE BLOOD LOSSES ON
LARGE BENIGN HYPERTROPHY CASES

cc.	Cases
U d r 00	3
00 to 99	4
00 t 349	5
35 t 499	5
500 t 749	3
7 t 900	
000	—
Sm. best blood loss	54
La. gest. blood loss (cases)	000
Average blood loss	39

by a spark gap condenser was employed for hemostasis. Whether the more highly damped cutting current that is produced by the Bovie generator would have resulted in smaller blood losses is not known. A comparative study of patients operated upon with the two types of cutting current would be of great interest.

Further data on the 176 cases having large benign glands indicate that external urethrotomy was performed for the introduction of the standard size resectoscope in 59 cases, 33.5 per cent. This constitutes a significantly more frequent need for external urethrotomy than in all of the resection cases in which urethrotomy was employed in 20 per cent. The greater need for external urethrotomy in the cases having large prostates is to be ascribed to the need for increased maneuverability of the instrument which is encountered in larger or longer prostate glands. Litholapaxy was performed in 3 cases for the removal of vesical calculi.

The period of hospitalization necessary for the treatment of prostatism constitutes one datum of interest and significance. The average preoperative hospitalization in this group of patients was 4.2 days, the longest being 37 days. The average postoperative period was 1.1 days with the longest postoperative period of any patient being 35 days. The average total hospitalization for the entire group of 176 cases was 16 days. This period of hospitalization compares very favorably with the average hospitalization for all prostates whether large or small that are treated by transurethral prostatic resection in this hospital (12.5 days). It should be pointed out in

TABLE III—COMPARATIVE CLINICAL DATA—
TRANSURETHRAL RESECTION—BENIGN LE
SIONS—1942-43-44

Age	La. gest. ds. (176 cases)		All benign cases (94)	
	yr.	rs.	yr.	rs.
Average	60	8	68	4
Youngest	48		5	
Oldest	88		9	
Hospitalization period	Days		Days	
	Preoperative	Postoperative	Preoperative	Postoperative
Preoperative	4		4	
Postoperative	37		66	
Total	35		38	
Average total hospital	6		5.5	

this connection that most of the patients treated in this hospital are from out of town and of necessity are kept in the hospital longer than are those patients who live in our immediate neighborhood. We usually discharge patients on about the 10th or 12th hospital postoperative day when they live out of town whereas patients who live in our own community are usually discharged on the 5th to 7th postoperative day.

There were 2 deaths following operation in this series of patients, thus the mortality rate for the group was 1.1 per cent. In neither of these cases was the cause of death to be attributed to the magnitude of operation performed upon the patient. One of the patients was a most unfavorable risk who had been on prolonged catheter drainage in an attempt to prepare him for some type of operation. He had besides his severe prostatism an organic brain syndrome and was completely uncooperative and required the constant attention of our nursing staff. Something had to be done to relieve his obstruction and continued catheter drainage was impossible. We were forced to decide between suprapubic drainage and transurethral prostatic resection and because of the difficulty of managing catheters of any type we elected to perform transurethral prostatic resection. One hundred and fourteen grams of tissue was removed with a blood loss that was estimated at under 300 cubic centimeters. The patient died about 2 weeks following operation and it was felt that his death resulted not so much from his operation as from his debilitated condition having to do with his organic brain syndrome. The other

death occurred in a patient who was suffering from uremia on admission to the hospital and who was kept on catheter drainage for a short period of time prior to operation. Urethral catheter drainage seemed inadvisable in this case and a decision was made to perform transurethral prostatic resection rather than suprapubic drainage in the belief that the resection operation would be no more shocking to the patient than would suprapubic cystotomy. This operation was performed early in 1942 at a time when we were performing the resection operation in spite of an elevated blood nitrogen level and unstabilized renal function. This and one other case in the second instance a patient who had a gland of small size both died of uremia in the early postoperative period and the cause of death was ascribed to early operation with inadequate preparation of the patient for prostatectomy. Since these two occurrences early in 1942 we have discontinued the practice of performing primary prostatic operations in the face of unstabilized suppressed renal function in the conviction that it is unsound practice.

In order to compare the clinical data on the group of patients having large glands with all of the benign cases treated by transurethral resection the data have been listed in Tables III and IV. It is to be noted that in only 3 instances are there important differences in the data on the 2 groups of cases. These are the average blood losses which are significantly higher in the large gland group and are of course to be expected the performance of external urethrotomy—33.5 per cent as compared to 20 per cent and the incidence of the administration of blood transfusions 39 per cent in the large gland group as compared to 10.8 per cent for all resection cases.

TABLE IV—COMPARATIVE CLINICAL DATA—(OPERATIVE)—TRANSRESECTION—BENIGN CASES—1942-43-44

	La g	gl d	All benign
	(76)	(ses)	ca (94)
Blood losses (verage)	39	68	68
	C	P	C
Est t th t my	59	33.5	88
Postoperat h mostas	6	4.3	
Transf ns	68	39	8
M rital ty			3
R resect	5	8	3.3

T tal cases	6	C ses	6
No pl	9		
Repl es	6		
Deaths	1	g hosp tal (d t p ostat
I lid —d e t ce b l dent	1	l v g	1
h p tal	4		
Th m th 3 ples f p tu ts wh a t			
Th p es t t m l d tu			
Th q est d th ples um ed f ll			
D y n nate mally w th t ff t?	5		
O d y b t t t t r n t?			
D y h y b r n g pai r n t?			
N	45		
Yes	5		
S m t m	3		
3 D y h m pl t r nary t l? Y	5		
If n t pl se xplai N	3		
O p t t had m pl t t f o m th —			
th bega t g h c n t l d w — y y rs ft			
p tu —h g nly t n tu c Thusp t n th d			
pet d li mixt njected th p um t			
P ent pe tu bl ding Afte pe tu h bled			
lyf d d ys d lyd ed as es lt f hem h g			
It is bel d th t th peri l ject l t t			
o th h m t t b g m y ha e pl y d p t h			
p o pe tu co tu c			
Th m n g p t t wh l k c m pl t t l			
h t ess tin s lght th t t n w y t			
f es th th tivitu f lfi —n th c d t f ec			
t ff f b su			
4 D y h m l d y f q cy? Y	46		
5 H w m times d y unat bet bedum	7		
d m r n g?			
N tum s	4		
On	65		
T th tum	4		
F tum s	4		
M th f ur tum	0		
6 I th r i clea?	5		
I t cl dy?	3		
S m time l dy	5		
7 I y s l f tu n w m vig	4		
Le vig than befo perati?	8		
I tun ha g d?			
N ply t th q tu n	93		

TABLE V—LATE FUNCTIONAL RESULTS

	P n l	Resect
	p ostat t my	
T tal cases (nsecuti)	oo	oo
Un t too f q tly		
(p t t puni)	5	7
Noctur		
N t t ll		45
O		31
Tw t f	4	3
M th a f	33	1
D ff lty w th r nati	6	1
Res lt—(pati t p)	6	1
W ll	89	90
Imp ed		9
Unimp d		1

TABLE VI

Hospital Number	Age	Am un f iss gm	Do you vo d rm ?		Burns pain		Com pl rot		N rm l d f qu cy		No. una				Se fun tio			Urin		Com
			Yes	N	Yes	N	Yes	N	Yes	N			2-3	On	I	Less	Un- b nag d	C	C d	
69			+				+	+	+			+				+		+		
6 7 S	66	8	+				+	+	+			+				+		+		
8 S		60	+				+	+	+		+						+	+		
	6		+				+	+	+			+			+		+	+		
5 56		8	+				+	+	+			+				+		+		
33	6		+				+	+	+		+						+	+		
8	7	8	+				+	+	+		+				+		+	+		
44 3		8	+				+	+	+			+				+		+		
66 8 5			+				+	+	+			+					+	+		
555565	8		+				+	+	+		+				N		ly	+		
36	6		+				+	+	+		+						+	+		
55 33	83	8	+		+		+	+	+			+			+			+		
5	8	8	+			+	+	+	+			+					+	+		
5 09		8	+			+	+	+	+			+					+	+		
6 99 S	8	83	+			+	+	+	+			+					+	+		
5 90	8		+			+	+	+	+		+						+	+		
6655	8	60	+			+	+	+	+		+						+	+		
563	7	90	+			+		+	+		+						+	+	St ss	
	6	8	+			+	+	+	+		+				+			+		
	65		+			+	+	+	+		+					+	+	+		
006	6		+			+	+	+	+		+				+		+	+		
6			+			+	+	+	+			+					+	+	Cloud m	
506	63		+			+	+	+	+		+						+	+		
36	63		+			+	+	+	+		+				+		+	+		
5 3			+			+	+	+	+		+						+	+		
890 6			+			+	+	+	+		+				+		+	+		
06			+			+	+	+	+		+				+			+		
6 66	6	3	+			+	+	+	+		+					+	+	+	D f 6	
60	5	8	+			+	+	+	+		+					+	+	+		
8	60	90	+			+	+	+	+		+					+	+	+		
			+		+		+	+	+		+					+	+	+	l b m mes	
5			+			+	+	+	+		+				+			+		
994 3	6		+			+	+	+	+		+				+		+	+		
5 3	69		+			+	+	+	+		+					+	+	+		
6 699		90	+			+	+	+	+		+					+	+	+		
3	—		+			+	+	+	+		+					+		+	Cloud 80 times	
6	3	3	+			+	+	+	+		+					+	+	+		
9906	—		+			+	+	+	+		+					+	+	+		

TABLE VI—Continued

Hospital Number	Age	Amount of tissue removed, gm	Day and night?		During operation		Completion		Number of days of hospitalization		Nocturia			Sexual function			Urine		Comments
			Y	N	Y	N	Y	N	Y	N	1-2	3-4	Over	1	2	Unchanged	Clear	Cloudy	
53	76	8	+		+		+		+			+				+	+		
5	5			+		+		+		+		+				+	+		II d mple II g h d m m f h co m r l II w t
66	3		+			+	+		+		+						+	+	
	6	8	+			+	+		+		+						+	+	
	67	8	+			+	+		+		+					+	+		Abn day f m l c
63 44S	73	00	+			+	+		+		+						+	+	
55	68	6	+			+	+		+		+						+	+	
35	6	5	+			+	+		+		+						+	+	
5			+			+	+		+		+					+	+	+	
8	60		+			+	+		+		+						+	+	
Total							+		+							7			

T total cases
T total cases port d 3
T total cases
T deaths—f b l ccd f crrhos fl
On pa b h d cce b fsc d d bedf

On the basis of these data it is evident that all the patients except one have had an excellent result of operation.

The present status of these patients is particularly significant when compared to the end results that were reported by Dr Edwin Davis and myself in 1940 when we presented comparative follow up data on two consecutive series of 100 cases. One group was operated upon by Dr Davis and had perineal prostatectomies while the other series was resected by the present writer—these patients had been glands of all sizes. In that report the data in Table V appeared.

We have long been of the opinion—based upon clinical impressions rather than factual data—that the end results following adequate transurethral resection are just as good if not better in patients who have prostates that are classified as large or very large as in those who have smaller glands and the comparative clinical data afforded by the present investigation would seem to support this view. In fact the majority of our poorest results have been in cases in which the resection opera-

tion has yielded less than 10 grams of tissue. In order to gain additional information on the question of the relation of gland size to the quality of end result following resection the data on the patients who had 80 grams or more of tissue removed at operation have been listed along with the details of their follow up reports Table VI. There were 53 such cases.

The data show conclusively that the very large prostates i.e. glands yielding 80 to 190 grams by resection have enjoyed end results following operation that are just as excellent as the results in cases that involved the removal of lesser amounts of tissue. Moreover among the 24 patients who had 100 or more grams of tissue removed there are but 6 who have nocturia 2 to 3 times while 8 have nocturia once and 10 have none at all—surely substantial evidence to refute any contention that the quality of results following prostatic resection is adversely affected by the magnitude of the gland.

The matter of sexual vigor following prostatectomy is one that should be of consider-

able interest to all urologists since many candidates for prostatectomy enjoy sexual potency and are interested in retaining it if possible. To be sure many men in this age group have for one reason or another lost a participating interest but not a few are surprisingly active sexually and the latter are often particularly anxious that this function be preserved. The urological literature is remarkably free from data upon the subject of the effect of prostatectomy on sexual vigor and in general prostatectomists appear to show an indifference in the matter. Most surgeons express the belief that persistence of sexual vigor following perineal prostatectomy is most unusual while that following suprapubic enucleation is relatively commonplace. In the present series of 176 cases there were 93 patients who stated that they noted no change in potency following resection while 25 had less and 24 an increase in sexual vigor. No replies to this question are available on the remaining cases. In the postoperative follow up survey of 1940 the resection cases were interrogated regarding the matter of sexual potency. Among the one hundred consecutive cases in that series there were 24 who reported an increased sexual potency while 10 had a decrease and the remaining 66 patients observed no alteration in sexual vigor.

SUMMARY AND CONCLUSION

An evaluation of clinical data on 176 patients with large prostates treated by transurethral resection at the University of Michigan Hospital discloses the fact that gland size was not a determining factor influencing the morbidity mortality or length of hospital stay.

Comparison of data on this group of cases with those of all benign cases reveal that the blood losses are greater when the large glands are resected and as a result that postoperative transfusions are more often required also that external urethrotomy is done more often in this group of cases 33.5 per cent than in all resection cases 20 per cent.

The end results following transurethral resection in this group of cases are considered to be excellent with only one case that can be regarded as a poor result. The end results in the patients having more than 80 grams of tissue removed were just as good as those of the other patients of this group and these facts support the impression that has long prevailed among experienced resectionists that patients with big glands enjoy just as good results following a proper resection as do patients having smaller prostates. That the quality of end result following transurethral resection is determined not by the size of the prostate but rather by the adequacy of its removal.

THE MANAGEMENT OF POSTOPERATIVE CHOLEDOCHOLITHIASIS

Another Use for Solution G

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THIS discussion is concerned with the specific problem of recurrent common duct stones as delineated by postoperative cholangiography with a brief review of existing methods of treatment and a report of 2 cases in which solution G was effective.

Previous to the advent of cholangiography the early diagnosis of postoperative recurrent choledocholithiasis was not often proved unless the obstructive symptoms of colic jaundice or biliary fistulas made reoperation imperative. Despite technical advances such as the wider acceptance of the several variations of spinal anesthesia for improved and sustained abdominal relaxation, well illuminated and transilluminated operative fields, the practice of dilatation of the sphincter of Oddi with Bockus dilators and even irrigation and aspiration of the common and hepatic ducts, a delayed cholangiogram provides the only assurance that stones are not left behind. Therefore carefully evaluated roentgenologic study of the biliary tree is indicated before removal of the Kehr tube.

Immediate or operative and delayed or postoperative cholangiography are available. The latter method is preferred because it enables the radiologist to make the examination where there is ready access to all technical facilities including those for fluoroscopy. Here injections can be made into the T tube and the medium followed visually as it passes through the ampulla into the duodenum. This is especially important in the final cholangiography.

Many types of radiopaque media have been used in outlining the biliary ducts. Bismuth paste and barium solutions were used by the

earlier workers in this field and more recently lipiodol, hippuran, potassium iodide and potassium or sodium bromide have been employed. Diodrast and thorotrast have also been used extensively. It is beyond the scope of this paper to discuss the advantages and disadvantages of the various media. Diodrast 30 per cent solution has been used routinely and with satisfactory results. Caution should be used if there is a history of allergy and suitable sensitivity tests may also be indicated.

The patient is placed on the roentgenographic table and in the supine position bile is aspirated by means of 30 or 50 cubic centimeter syringe. The ducts are then irrigated with 50 cubic centimeter of warmed normal saline solution. Sterile technique should be employed because of the possibility of extravasation of the solution or of the diodrast. The syringe is then filled with diodrast which has been previously heated to body temperature. Injection is made (10 c.c.) under roentgenoscopic guidance and spot roentgenograms made in the anteroposterior and oblique projections. An additional 10 cubic centimeters is then injected and another film is made, a Bucky diaphragm being used. A final injection is done and the last film is made in the oblique projection. If there is any delay in the dye entering the duodenum films may be made at 15 minute interval. Amyl nitrite or nitroglycerin may be given in case there is undue delay in duodenal filling in order to differentiate spasm from organic obstruction.

Postoperative common duct concretions develop from small nuclei of biliary debris or may descend from the higher hepatic radicals which are not reached by probe suction or irrigation. With the increasing practice of choledochostomy coupled with routine postoperative cholangiography, many more of

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m. t. diol. H. m. H. p. l. I. E. m.
sea. h. soc. h. m. ry. H. d. t.



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The admini tration of solution G was borne
by the patients without di comfort of any kind
They expressed the same opinion—a feeling
of well bein^g after the instillation of the first
1000 cubic centimeters There was no pain
A mild diarrhea occurred in Case 1 and in
both the stool vere green in color

While the clinical results in the 2 reported
cases were excellent *in vitro* experiments con
ducted later results were di appointing when
it was found that solution G per se and in a l
mixture with bile over a wide concentrati n
range had no apparent ability to di solve bil
iary calculi of cholesterol type Noted durin
experiments were bile flocculation and some
change in appearance of cholesterol calculi sur
faces but no perceptible weight loss

Since these experiments indicate that solu
tion G does not reduce cholesterol stones chem
ically other explanations of its mode of action
may be considered

While the pH of liver bile varies between 8
and 8.6 and gall bladder bile between 3.0 and
6.0 that of solution G is about 4.0 Such a
solution might be sufficiently irritatin^g to the
mucosa of the common duct and sphincter of
Oddi to activate the circular lon^gitudinal and
oblique unstripped muscular fibers found in
these structures

Since solution G so clo ely re embles liquor
magnesi citratis (U S P) mi ht not the re
sults be explained upon its cathartic action

SUMMARY AND CONCLUSIONS

1 Recurrent choledocholithiasis di
cussed from the point of view of the surgeon
radiolog^{ist} and chemist

A brief review of the literature referrin
to ex^{tr}in^g method of treatment is presented

3 Two case histories are cited in which so
lution G was effective

4 Explanations of the possible mode of ac
tion of solution G in the common duct are
sug^gested

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MARCH FRACTURES

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Hollywood Calif

MANY articles have appeared in the literature during the past 3 years on the subject of march fractures and it is significant that the authors concerned were of the Army or the Navy Medical Corps. In peacetime these fractures rarely occur but they increase rapidly in wartime especially during that period in which the recruit goes through a basic training program which entails a great deal of drilling and marching. Because the lesions are so often precipitated during a march—46 percent—it has been appropriately termed march fracture and even though many other names have been suggested from time to time the term continues to appear traditional of these nontraumatic fractures of the metatarsals. Similar fractures are being reported in other bones particularly the tibia femur fibula os calcis and more rarely in the pelvic bones and ribs and they together with the march fracture are commonly referred to by J B Hartley's descriptive term fatigue fractures of bone.

It is the author's purpose to report some observations made during the treatment of 58 cases of march fracture in the period from September 1944 to February 10 1945. All the patients were males who developed their trouble during some phase of the recruit schedule at a large Naval training center having a complement of 32 000 men.

First it will be noted that the general data recorded in Table I parallel those of other authors and are therefore not considered unusual. However the general body type encountered may reflect a slight glandular imbalance inasmuch as 57 percent were either tall or fat this finding together with the pulse rate—62—may signify as will be pointed out later a mild adult hypothyroid state. In this series only the second and third metatarsals were affected there being no instances in which the first fourth or fifth were involved. One case is unusual in that the patient developed a march fracture in the second and third metatarsals not following the other at an interval of 12 weeks (Fig 1).

ETIOLOGY

Many hypotheses have been advanced in the past to explain this lesion and the following summary indicates that much uncertainty still exists as to its origin. We shall subdivide the various causes in the following manner:

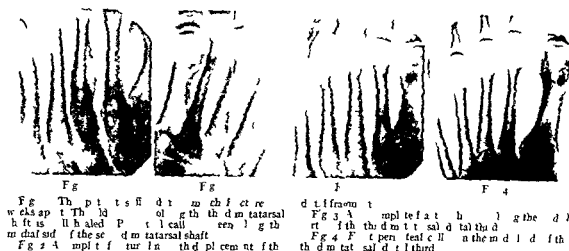
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7 Spa m f tri m scl (4)
8 F n ti lly k foot ()

- II P d po g ca es y l
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N l g d t b (3)
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Forty eight of our 58 cases were studied from the standpoint of metabolic rate. The test was made after a 4 hour period of bed rest and the average was found to be minus 10.72 percent. The lowest reading recorded was minus 32 percent and the highest plus 8 percent. There were only 5 plus readings. Twenty seven or 56.2 percent were minus 10 percent or lower 15 or 3.2 percent had readings of less than minus 15 percent and 6 or 12 percent were below a minus 20 percent metabolism. It is realized that great differences of opinion have arisen as to what constitutes the signs of hypothyroidism in cases not presenting the frank typical picture of myxedema or cretinism yet it is true that in adults we are forced to accept a lowered rate of metabolism as the most significant of the physical findings. A decreased rate cannot result from emotional disturbances and it offers more reliable evidence of hypothyroidism than a high reading does of hyperthyroidism. The only associated symptoms of hypothyroidism and glandular dysfunction found

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in our patients were the lowered pulse rate (average 72) and the fact noted above that 57 per cent were either tall or fat. There was no evidence of fatigue, weakness, nervousness, dry skin, or constipation noted. The relationship of a hypothyroid state to bone metabolism in an infant is clearly known for if that deficiency has extended over a considerable span of time the characteristic picture of cretinism will develop and skeletal changes especially in the epiphyses will occur due to a delay in the appearance of ossification in the cartilaginous center. The relationship, however, between hypofunction of the thyroid gland and the skeletal physiology in adult is not clearly known yet it

may be that lesser degrees of osteoporosis develop if that deficiency is continued over a long period of time as in the case in hyperpituitary and menopausal syndrome.

THE CLINICAL COURSE

A variable amount of time elapses between the start of recruit training and the appearance of initial symptoms. That period may be from 7 to 105 days which represent the extremes found in this group. The average lapse of time however is 44 days and the first symptom is usually a burning pain which comes on in the course of a hike of 5 or more miles. The onset of that pain may be acute 46 per cent or insidious 36 per cent. The remaining 18 per cent could not be ascertained. A characteristic limp parallels the pain and these symptoms in turn are followed by soft tissue swelling on the dorsum of the foot. The severer of these cardinal symptoms (pain, limp and swelling) increase for 7 to 14 days when a plateau is reached in which they remain more or less stationary for 4 to 7 days. Following this stationary phase improvement begins and if untreated it will progress slowly for 14 to 21 days. These 3 phases in the course of a march fracture are both typical and constant and they serve to determine beforehand the length of treatment which will subequently be required. Ten per cent of the men were admitted during the first phase, 27 per 46 per cent during the second phase and 21 or 37 per cent were admitted for treatment while in the improving or third stage.

The stages herein described are based largely on subjective findings obtained from the patients themselves but are not infirmly supported for example the man minimizes his symptoms

TABLE I.—GENERAL FINDINGS RECORDED IN 8 CASES OF MARCH FRACTURE

Number of miles	58
Age in years	9
Appearance height in inches	74
Appearance weight in pounds	59
Body types	5
Normal	43
Tall	3
Fat	5
Days in training before symptom appeared	8
Participating cases	4
March	7
Obtained release	4
Not killed	6
Litigating	3
Degree of activity	6
Completed	5
Completed (including those hospitalized)	90
Arrested pulse rate exceeded 33 cases per minute	80
Highest pulse rate	44
Lowest pulse rate	60
Metatarsal involved	4
Second	4
Third	3

in order to stay out of the sick bay. One must then be guided by the physical findings which are limp, localized tenderness, ability to walk on the tip-toe, soft tissue swelling, and the degree to which the long extensor tendons of the toes are obscured.

X-ray evidence of march fracture may not be forthcoming on an early plate, but is likely to appear after the 7th to the 10th day of illness. It has been our observation that roentgenologically the cases will fall into one of two major groups so far as prognosis is concerned. The smaller group—30 per cent—is the most significant (Fig. 2) for here the fracture line runs completely across the shaft of the bone. The larger group—70 per cent—will either show an incomplete fracture line (Fig. 3) or simply a periosteal shadow (Fig. 4). We find it expedient to group the last two types together as their response to treatment is usually the same.

TREATMENT

While there may be differences of opinion with respect to the etiology of march fractures, there is general agreement in regard to the treatment which conventionally consists of a short leg plaster-of-Paris cast for 3 to 5 weeks followed by a period of physical therapy and a gradual return to weight bearing which requires an additional 2 to 3 weeks making the period of total disability between 5 and 8 weeks. Simple strapping and the use of metatarsal pads have been tried, but the results are disappointing. Longitudinal metal bars and transverse Thomas bars applied to the shoe have also been used with slightly better results. Some have advocated bed rest in recent months but as yet no report on the results of such treatment has been published.

Our routine entails the principle of bed rest for a period of about 5 days and the administration of desiccated thyroid (U.S.P.) 1 grain three times daily. The patients are given bathroom (head) privileges and they are furnished crutches for this purpose. The amount of bed rest required where the fracture is complete averages up to 9 days. An examination is conducted daily with particular respect to the soft tissue swelling and it has been noted that the swelling will disappear gradually in 2 to 5 days although the foot will appear swollen for many weeks due to the presence of periosteal callus at the fracture site. It is important that no differentiation between these two (inflammatory and reparative) types of swelling can be done very easily by what our patients have come to call the pinch test (Fig. 5). By pinching the skin (either the second or third metatarsal head) between the thumb and index



Fig. 5. Pinch test. The left photo shows the thumb and index finger pinching the skin on the side of the foot. The right photo shows the thumb and index finger pinching the skin on the top of the foot. The text below the photos reads: 'Pinch test'.

finger on both the normal and affected feet, a thickening or turgidity in the subcutaneous tissue will be noted if inflammatory edema is present. In most cases this test will become negative at the end of the third, fourth or fifth day. Bed rest is continued for 2 days after the pinch test is negative. The patient is then allowed up and returned to full duty with a supply of thyroid tablets sufficient to last a total of 19 days. No other treatment is given such as strapping, shoe corrections or physiotherapy.

RESULTS

In general the results obtained by this method have been exceptionally good as shown in Table II. The immediate results are 90 per cent good in that practically all the cases are symptom free at the conclusion of the hospital stay; they are able to walk without pain or limp and the pinch test is negative.

The intermediate results were recorded by periodic examinations throughout the first 2 weeks of duty. During this time no relapses or failures were encountered although minor complaints were made by approximately one half of the men. These symptoms were plus minus in character; for example, it doesn't bother me unless I double time too much, or it hurts a little in the morning when I first get up, or it felt funny the first few days after I left the hospital, but not enough to keep me from duty. These were typical comments in the patients.

TABLE II—RESULTS OBTAINED IN THE TREATMENT OF 58 CASES OF MARCH FRACTURE BY BED REST WITH AND WITHOUT THYROID MEDICATION

		Age	Sex	D of bed	Res										F		E	
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Acc f d		G h r o l													oa			
h m f		N h d				6	8											
E	b m l b m	m l u	d d h	f f d	b a s	c c a s	l p a	d d f	h	m		s a r y	h f f		h			
Thes																		

own words and indicate that the foot is not perfect after the period of bed rest but in the absence of any objective signs is capable of withstanding ordinary line of duty. Any extremes of exercise are likely to remind the patient of his recent injury. The intermediate results indicate the beneficial effect of the thyroid medication for in those who received thyroid there were no complaints in 63 per cent while among those not receiving thyroid only 41 per cent were symptom free. This difference tends to corroborate our view that the systemic factor may be hypothyroidism.

The final results were uniform irrespective of all the available factors i.e. the use of thyroid and the state of the lesion on admission made no apparent difference in the outcome. On the basis of excellent and fair results out of the 6 complete fractures we may look to this group as the most unique team.

SUMMARY

1 Fifty-eight cases of march fracture are presented of which 45 were studied from the standpoint of basal metabolic rate. The average rate as minus 10.72 per cent. The average pulse rate was 62 and 57 per cent of the men were rather tall.

Bed rest for a period of 5 days and (in 4 cases) the administration of desiccated thyroid (1 grain three times a day) for a total of 19 days was the routine treatment followed.

3 A test described by Herber as differentiating inflammation from periosteal welling. The test is a guide in letting the patients up.

4 Mild nondisabling symptoms were complained of in half of the patients thus treated (these symptoms lasted from 1 to 14 days).

5 Those who received thyroid showed better intermediate results than those who were treated by bed rest alone.

6 The final results were excellent except for that group having complete fractures.

CONCLUSIONS

It is probable that a mild hypothyroid state may be a predisposing systemic cause; patients who develop march fractures. Cast treatment not necessary nor is it indicated except possibly in those cases in which the fracture line is complete. Bed rest continued through the period in which the inflammatory swelling disappears and continued for 5 days thereafter is the treatment of choice. The administration of thyroid best effect for a short period is apparently helpful.

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FLUORESCCEIN—ITS USE IN DETERMINING THE VIABILITY OF STRANGULATED INTESTINE

C ALEXANDER HATFIELD M D ROBERT A BUYERS M D d
ADOLPH A WALKLING M D F A C S Ph d lph P 5yl 1a

IT may be stated that the diagnosis of viability of strangulated intestine has not been an exact science. As Wainstein noted in borderline cases it is difficult to be certain by any method. Owin's and Smith stated in reference to determining the safe point of resection. The more experiments we did the harder we felt this point was to determine with any degree of exactness. The potential viability of strangulated bowel has for the most part been estimated purely on a clinical impression based on return of color pulsation of blood vessels presence of peristalsis and other signs found reliable by the individual operator.

Failure to diagnose properly damaged intestine carries a high mortality. The death rate in suspected strangulation with subsequent resection of doubtful bowel is three times as great as in those cases that escape resection (1). Until recent times no one has been able to remove the doubt in doubtful cases while the obvious ones need little comment.

The use of fluorescein is a relatively new diagnostic aid that appears to be accurate and simple. Herrlin, Glasser and Lane reported as recently as 1942 the clinical use of fluorescein among other diagnostic aids in 4 cases of hernia and 1 of strangulated omentum. We wish to present 5 cases in which fluorescein was used at the Pennsylvania Hospital with satisfactory results. Its use clinched the diagnosis as well as furnished considerable information. It is a worthwhile method of determining whether or not bowel is still viable. If there is a reasonable doubt about the viability of a segment of bowel whose removal would jeopardize a patient's life the fluorescein method of evaluation is simple, safe and accurate.

Fluorescein, a form of esorcinophthalen, is extremely diffusible (3). It also absorbs ultraviolet rays of long wave lengths. When these rays of 3660 Angstrom units strike fluorescein they are instantly converted into the longer light waves of the visible spectrum. In 1931 Lane and

Wolheim (4) showed that this fluorescence could be demonstrated in living tissue. All that is necessary is a small amount of fluorescein in the circulating medium and the tissues glow when exposed to ultraviolet light filtered with a Wood's type of filter. Chemically the dye appears inert in mammalian circulation. Pharmacologically, except for an unidentified interference with the activity of novocaine and pontocaine, the dye is inactive and is effected unchanged by the kidneys 99 per cent in 30 hours (1). The percentage of dye in use is a 5 per cent suspension of fluorescein in 5 per cent sodium bicarbonate solution having a pH of 5.7. The dose is 20 cubic centimeters (1 gm.) of this suspension intravenously. We have observed no untoward reaction in over 50 cases.

Depending on the circulation on time the subject will be seen partly to fluoresce (90 seconds) by the time the eyes are accommodated. The degree of fluorescence depends on the type of tissue and amount of pigment present. The skin shows up quite well in normal white persons, poorly in the colored race. The mucous membranes and serous surfaces in both races show up equally well.

Inspection of the serosa of normal bowel exposed to filtered ultraviolet light when fluorescein has not been injected revealed coloring that is uniform. The intestine is dark purple with a smooth velvety consistency. In marked contrast the presence of fluorescein in the bowel makes the serous surfaces under the filtered ultraviolet light glow greenish gold with release of visible light that will evenly illuminate structures immediately adjacent. Bowel that has been temporarily or permanently deprived of its blood supply appears when exposed to this light an even deep velvety purple. The contrast between this deep hue of area and the brilliantly glowing greenish gold bowel is dramatic and colorful. Similarly when circulation returns and viability is restored the gradual conversion of the dark purple color of the doubtful areas to a glowing golden state is unmistakable and astonishing.

On the basis of Lane and Boyd's work, who showed that fluorescence readily occurs where

F. M. H. Surgical Service, A. T. H. P. 5yl an H. Pital.
Read before the Philadelphia Academy of Surgery Jan. 1948
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viability is present (3) and that it fails to occur when irreversible change has taken place. Fluorescein was used in 5 cases. Each one presented a loop of small bowel so involved as to have a doubtful reversibility state.

CASE REPORTS

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U d t p nal esth a c t u g per i
t eal n g was f d Th t gult d p t f m l l
bo l was d ed th col f h h t s at f
tory Fl esc w ject d t ly lnt lly
th re was f sc th t n t d bo l H
t th end f m tes th bo l placed in
th bd m l ca ty f esc ee t occu
thr u h t h t loop f d btl f bo l H m
phy was compl t Th p o t pe t co rse was benign
and p t t as discha ged th 4th post pe t day

CAS V P whit m l 58 y rs f g was d
m t t d t S r gical S c A f th P yl H
p tal J ry 3 944 H b f mpla tw p n f l
h m in th l f t g r n f ks H h d had bow l
m m t s f days H was t d th d y f
dm Physical m t l d th bd m

soft b t hup g t h e d pe talt c k l sw h d th gh
t pe stal tu ru h I th l f t gu l th m d
was h d m ss 6 t m t r s d met w th m d
es th l y g k l Th m w d cibl d
d th w p tal t Th p p t u
diag was t gult d gu l h n

At pe t sa w s f d d P p t l g m t
h ch ta d t m t r s f d k d b w l Fl
esc was j c t d t o ly N f sc
ed in th loop f b w l t f s t b t f w m t
f sce was t p ad gr d lly th t
doubtful Th l p w t r n d th p t l
cavity and th h r n w pai d Th p o t p t u
diagnos as ca t d f m th m

After peratu p t t g l c d t l l t
A m l h e m t m d l p e d th d b t t esol d
t s f g r d lly

C s 3 M K whit g l 43 rs f g w d
m t t d th L y g I D v f th P yl an Hos
p tal A gust qh 944 w th hst ry f col k y p n
and th mb l Th most c t t t t a c k f p
occurred d ys bef adms d as mpani d
by nausea and m t g Th f l f th pau

Physical xam nat ealed an t m lly l p t u t
with t mpe t r e f 3 d g ees Th bd m was
slightly dist d d with g lized t d rnes p e s t
P r tals was hypo u A mass was p lated in th
ght pper q adra t d th right dn xal gu
Th pperatu d gnosa w tw ted nan yst
At operatu large t s s c p t as f d d r e
d ced Th d m ged bow l h h w t r m nal ulum

th polyp bo t 6 ce t m t r s f m th l o c c a l l
was t m p rpl d fill d w th f d A foul od was
p e s t Expo t Wood l m p f t f esc
j t e d t ly h d f l esc ce f t
m tes f pp r t t m t Th bo l w s r s c t e d
d p a i r e d by d t - s d t m f th f i t
48 h r s f p u t m a w d t d th
p t t p gres w ry t rmy Sh p o d g r d
lly d discha g d n th 4th p t peratu d y
Th p th l g a l p t t th t th g m n of i l m
m d h w d g gr w th g g s p l y p c a
g i n t s c e p t

C 4 J S whit m l 6 y f g was ad
m t t d t S r gical S c A f th l y l a m l l p t l
N mbe 6 944 Th p t t g e f t h y f
h f y Th h t so t d w th
p t l 4 m th g At th t m th h l m
d d d t th s c t m d c k d t b d e d
d lly by th p t t H phy d d d th
d t u d th m p t l th d y f
h p t a l d m s s F h p t l the tun th
p t t w seen t th h p t l h c p l d f g r t
p th s c r t m H lso m t e d Th p a n was
d s c r i b e d as c o t d l u g h a c t e

At phys cal xam t th b r m l f d g s c t d
f l a g t d m a s s th ght s c r t m P r t l
th bd m was f ly t Th w som t d
th n ght l w q d r a t f th bd m The p
p t u diagnosi t gult d d c t i e u l
h r n a

Th p t t was perat d 3 h r s f t adms
Th h r m w e d c e d d th in l d bo l p e d t
b e d k p rpl d m t u s d t a d s o m th m
b o s e d b l o o d e s s e l D m g b O g r m f
f l esc wa j e d t ly E p o f m
bo l t Wood f i l t d d t t f t f l f esc
H w m t f d lly v i b l
lth gh t d t that p p e g m b o w l
W th diagn f h b n l th loop t d t
th bd m d th h n h phy m p l t d The post
p t u r s e was e v t f l d p t t d
ch a g e d 4th d y

CAS 5 R P l e d m 4 y f g w s
f r e e d f m th M t t y d p t m t f t h l y l
n H p t a l D m b e 944 t S g u l S
A bec f l u k y p th l d m e d
m t g Sh h d h d g d t u d c
u p t Th p t g h t y o f h g h d
h n t h l f t g r h h h d d c d t l f p
ta l y d y s p u s l y

At phys cal m t th bd m w f l t o b
d t d e d d r y l t l p r t a l w h d M k d
g l a z t e n d r n e s p e t e s p e l l y t h l f t
l q d r t f th bd m h m a s s w p l p b l
Th p t u p n d m k e d p h th l f t g u n a l
g w p l p t e d P l x a m t l d l g
f i r m m a s s t h c u l d s a

Aft th bd m l l w p e d th post m
t sh th and perit m w f d t b e q u t t h k
d d e d m t B l o o d y f i d d l o o p f t u
b o w l p r e s e t h p e t e u m Th l e s
l u l f t h t r m i n a l m w th t b a s e t h p e g
f t h h m a l s a c F l e s c e t d y h d b s o l t l y
b u l t y p p r o x i m t l y 6 c h e s f b o l f t
m t f p p o t t t r e a t m t Th m p m i s e d b o l
as e s e c t e d d s i d t o s i d a n a t o m o s w d

Aft peratu th was m l l n t m p e t d
p l s e th d d 4th post perat d y Th h r m
was p a i r e d t h 4th day aft th e s c t u f d m g e d
i l m M c r o s c o p c a l l y l l s e c t n s h w d m k d h m

h ge d destru ti l rmal tiss architectu O ly
few m scl l m ts w till de t fiabl

In none of the 5 cases was fluorescence visible in the involved loop of bowel at first inspection. After treatment for no longer than 20 minutes in any case with the usual supportive measures the bowel was seen to fluoresce in 3 patients. These loop of bowel were diagnosed as being viable and were returned to their respective abdominal cavities. No fluorescence was observed in the two obviously gangrenous loop of bowel which were resected. Microscopic sections of the bowel showed necrosis of all the coats of the bowel wall in both cases. In one (H. R.) of the unresected cases an area of nonfluorescent bowel in the damaged loop was found to be caused by a subserosal hemorrhage with glowing bowel wall demonstrable beneath the dark portion.

SUMMARY AND CONCLUSION

Five cases are reported in which fluorescein has been injected intravenously and an ultraviolet lamp with a Wood's filter was used to determine fluorescence in damaged bowel. The presence of

fluorescence was sufficient evidence of viability to permit return of these damaged loops of bowel to the abdominal cavity. The absence of fluorescence was diagnostic of nonviability confirmed by microscopic section.

Postoperative course and pathological sections seem to bear out the prognosis based on the fluorescein method.

There seems to be adequate evidence that this relatively simple method removes the uncertainty from a diagnosis which never has been classified as exact.

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Phys i gical and Cl i c sul t th Em
phases Th y Includ D sc pt f Op r
ti P oc du es d d Springfield Ill d B lu
m Md Ch les C Th m 94

STRUMA LYMPHOMATOSA STRUMA FIBROSA AND THYROIDITIS

J A SCHILLING M D Rochest N w Yo k

THE large proportion of cases reported under the general heading of chronic thyroiditis are of a nonspecific or unknown etiology. In the various subgroups of nonspecific chronic thyroiditis namely struma lymphomatosa (Hashimoto) struma fibrosa (Riedel) and the pseudogiant cell type or struma granulomatosa (De Quervain) there are no single pathognomonic or distinguishing features. The result has been a marked confusion in the literature where names have been used loosely without precise clinical and pathological description. It is our opinion that struma lymphomatosa is a clinicopathologic entity. Struma fibrosa and its pseudogiant cell variant are different manifestations of the thyroid's response to inflammation. These two groups are considered separately only to emphasize their essential similarities and relationships.

The general subject was touched upon during the Eighteenth Century with descriptions of suppurative and nonsuppurative thyroiditis (10). Later there were distinctions drawn between inflammation of a normal thyroid and a goitrous thyroid. In 1878 Kocher claimed that all inflammation of the thyroid was of a metastatic origin. In 1884 Bowlby at the Pathological Society of London presented a case of infiltrating fibroma of the thyroid concluding that it was of a malignant and sarcomatous character. De Quervain (3) in 1904 stated that nonpurulent thyroiditis was a disease sui generis with definite clinical and pathological characteristics. Riedel (5, 53) in 1896, 1897 and 1910 described the extreme fibrosis and adjacent adhesions of the thyroid gland under the heading of *E. senharte Strumitis*. Hashimoto (11, 1912) described a diffuse enlargement of the thyroid gland by lymphocytic infiltration and lymphocytic hyperplasia with accurate clinical and pathological descriptions. This he considered an entity and not related to Riedel's *E. senharte Strumitis*. Dr. Ewing in 1922 believed that lymphoid infiltration and hyperplasia and fibrosis of the thyroid were the early and the late states of the same disease process which he designated benign granuloma of the thyroid. Without reference

to Ewing's opinion Williamson and Pearce (6) first in 1925 described a lymphadenoid goiter similar to the descriptions of Hashimoto. Graham and McMullagh (5) in 1931 in a complete review of the literature with additions of cases of their own separated the diseases as described by Hashimoto and Riedel into clinicopathological groups. This cast a shadow on Ewing's widely accepted opinion of 1922 and 1928.

During the next decade there was a great deal of confusion in the literature with supporters for and against the unitarian concept of etiology as expressed by Ewing. However the excellent views of Clute *et al* (7) in 1935 and McClintock and Wright in 1937, Joll in 1939, Hardy in 1940 and McSwain and Moore in 1943 to ether with numerous authors reporting cases now support the balance heavily for clinical and pathological distinction between struma lymphomatosa and struma fibrosa.

At present many cases reported as struma fibrosa are confused with the more acute and granulomatous form of chronic thyroiditis so beautifully described by De Quervain and Gordanengo (14) in 1936. They reported 8 cases of subacute and chronic thyroiditis of a nonspecific etiology. They traced the various stages of acute to subacute to chronic thyroiditis. The latter is characterized by many cellular aggregates resembling foreign body cells, acute and chronic inflammatory cell infiltration, acinar degeneration and obliteration with marked fibrosis. This confusion is justifiable as struma fibrosa seems to be a late state of the earlier more acute forms which may resolve or may be progressive in their pathological changes.

CASE REPORTS

Struma Lymphomatosa

C	No	994	A	W	3	ye	ld	wh	f	m	l	h
if	first	dm	tt	d	t	th	St	G	M	m	l	H
M	y	4	938	H	h	f	mf	t	as	p	d	gr
h	g	t	o	at	d	w	th	dysph	d	rv	s	es
m	th	d	rat	Sh	d	t	d	mod	t	l	g	m
f	h	g	t	f	4	years	P	th	u	ry	eal	d
p	m	n	t	illect	m	saphe	l	g	t	3	lf	
d	d	ed	boru	d	rm	l	f	ll	t	rm	p	gn
Th	w	re	s	istent	disea	s	L	bo	t	ry	t	s
h	ut	blood	t	t	be	85	b	sal	m	t	bol	rat
pe	t	Wasserm	nn	g	tu	Phys	cal	xam	tu			

From the Department of Surgery, the Rochester University School of Medicine and Dentistry

ealed & w l d l ped d nshed femal Tempera
re p lse and resp rations w re orm l Blood press re
w /7 Th thyro d was firm d diffusely enlarged
t t d with trach al t g wall w i g Th re was
od le th right l be

At perati n right bt tall bect my w perf rmed
N dhen ns w re ted Grossly th cased tiss was
firm tough d cell la mea ring 3 by f r e t m t r
Microscop ally th re was rease in fibro tiss d
m rked l bulat f th gla d There was carnadeo ra
t n with l w flat cubo d l eph th m l ltl coll d
d small sz of c The was diff e infiltrat w th
lymphocytes d um n lymph f lides with germinal
t r s Post pe t rse was tful At f low p
g weeks aft operati f rth l rgement f l t eck
was ted B sal m t bolic rat t that tum w — 6 pe
t d th re w re ly gns f myxed ma Shooting
pai in h f rehead w re ted

Th pati t was re d mtted April 9, 1939 beca se f
tightnes bo t eck dy phagi d h ki At th t tum
in ked diffuse l rg m t f the l f t l be d isthmus
f th tr d as ted Basal m taboli rate was — 3 pe
t ch leste l 6 milligram pe t

Al f t bt tall be t my ealed firm fib owed l be
which r l th tra h t n ly with t dhen ns
Grossly the cased t s w to h d fibrou The micro-
scop p tur was lm t d tucal th the first secti
mo this pre dy except that th lymph f lides with
g rmal c r w re m r d scret th w les gen ral
lymphocytes infiltrat d mod rat creas co
ect tiss Post perati co nlesce was un tful
th m ked reh f f bstru ti e ympt ms Myxedem
was t lled by 60 to 90 milligram f thyro d str t
rally each d y be ye rs aft t adm 300 mil
l or m f thyro d str t cessary ch d y Oth
w in good h lth

CASE 2 N 332 S V K 7 yea Id whit f m l e
h usew w first d mtted th St g M m n l H s p
talm V rch 938 H rchi f complaint was f t u hness in
h k and dy ph r f l s wly p oressa tar f 3
ye rs d ratu F years pre ly t th h p tal
h had h d larged isthmus f b thyro d rem ed
with th path l mead d nos of bro thyro d t d
cell l hyperpla Luf tun t ly th u r microscop c sec-
ti s destroyed Past history was egati Sh had
h d r m l p eguancy Laborat ry tests h wed her
whit blood co t t be 7 co Wasserman egative n
b sal m tabol rat take Phy cal xaminati re ealed
l lde l ped and unshed f mal T mperature pulse
resp rati ns re rm l Blood pressure w 7
Fundi g w re erat ept f r hard diff se enlarge-
m t f both l bes f th thyro d more ma ked the
n ht

At perati b l t ral s bt tall thyro decotomy was pe-
f rmed Th nly dhen a ted w re t th ut f th l d
midline sca Grossly the gland was tw t three times
rual sz firm grayish yellow w th lttl bleedin
Microscop exams ast e ealed diffuse lymphocyt i
filtrat n with num rous lymph f l lles with germinal
ters There was ly slight increase in fib ous t
Th re w marked cuna tr phy a d th collo d was ry
scanty Post perati e co re was un tful

At f low p 4 1/2 years late ur t ral t was rem ed
transp rantly ealy t and a half years lat basal meta-
bo rat was +4 thou h ympt ms and signs f mild
myxedema w re ted w th h w co trolled on 3 mil-
grams f thyro d rally a d y

Patients in Cases 1 and were operated on
twice In Case 1 the microscopic sections

months apart are almost identical and are re-
prod ced here In Case 2 the microscop c secti ns
of the first operation 5 years previously at another
hospital were unfortunately lost The microscop c
diagnosis at that time of chronic thyroiditis and
cellular hyperplasia however infers that little if
any change occurred in this gland during the 5
year interval These cases may be added to those
of Perman and Wahlgren Roulet Clute *et al* (7)
McClintock and Wri ht f l l Helliw and Heyd
Each of these authors reported a case in which no
essential microscop chan e from the original
p ctur had occur d over periods up to 9 years
Heyd stated that h s original microscopic secti n
revealed struma lymphomatosa and the sec nd
operation revealed struma fibrosa thus c nfr m n
Ewn s beliefs However on review of his ma-
terial the e seems little q estion that the first
operat on on the patient revealed a struma fibrosa
and that there was actually no transition except
in degree of fibrosis and adhesi ns

CASE 3 N 60460 E A wht f m l h d w
d mtted f th th d t m t th St g M m n l H osp
tal J 943 H h f m pl t l p ess
eck grad l easu g fullnes f eck t noly d
dysp e f y ars d ratu n Sh had be f l lde y
by h pri t phys bel dm f g ry d r
ing which tum th ympt m w l y p gres f t
hi tory aled t be cul d mus y rs p ly
T mia f p regna cy occur d 4 1/2 ars p t dm
with t rminati n f p gna cy by esa t d
hyst ect my

Laborat ry xam ti h d h t blood t t be
8 400 basal m tabol c rat — 8 pe t Wasserman
egati Phys l m m t r l d m l t mpe
ture puls d resp rati n blood press f 7/9 d
w egati p f f firm d f n l g m t f th
thyro d gla d tw t th times rm l z

At perati n b l t ral bt tall thyro d t my w pe
f rmed Grossly th tis used w s lormly firm d
fin ly l bulated Microscop xam ti h d diffuse
lymphocytes infiltrat with m lymph l l l th
g rmal c r t r light cr a e connecti e t
m ked acina d ge erat n w th sca tv l l d lost per-
ati co rse was un t l At f l w p 4 m th lte
perati basal m taboli rat w — 7 pe t th
gns d ymptom f ea ly myxed m At p ese t D
cembre 944 h co t l he ympt m th 3 t 60
milligrams f thyro d tract rally ea h d y d is
therwise llent h lth Sh h ted th less thyro d
extract is necessary now than immediately afte perati
t co r l sign d ymptom f myxed m

CASE 4 N 6 LS 5 yea Id whit m l was
first d mtted t th St g M m n l Hospital J uary
94 Th chief complaint w lump eck d hoarse
ess f 7 m ths d ratu H lso t d pa esthes as f
extremities H was f l lted th ra k d diti
pseud exanth m lastu tum and had th associ ted g d
breaks f th retinas w th p gressu ly ladi gory on P t
hust ry w esse tally egati Fam ly h t v re ealed
siste with a similar skin lesi n

On physical xaminati mper tur pulse and resp ra-
ti re rmal blood pressur was 60 8 Ther w
loss f lastu ty f th skin f th ppe trunk and eck

d t was th k ed Th w a diffus nla g m t f
h thyr d most p us f nla ged thm ly was r d
At peratu c m f nla ged thm ly was r d
t b t dhes w t d G ssly th c d t
was m th firm t gh w th yell vish cast M r scop
aminati al d diff f l t n with lympho-
ytes d um us lymph f l l with g r m nalc t r s
Th re w mod t in t tis p
acula ly n t bul septa Th as lm t mpl t
bs nc f c p th hum The w plasm ll
Th re wa tra cin llul g greg t ns m
g f re n body giat lls P t p e t r s w
tful P t t d 800 f d p ray t night
and f t n rva l g At f ll w p b sal m ta
bol rat h r tly ft pe t -33 pe ent Th
thyr d gla d m t d w y n i z f ll g h y d
m th t th ck h d d r ed f h ir um
fre Th p t d l p d mld g d d ympt ms f
myxed m d was t l l d n 6 t go m l l o r m f
thyr d tra t lly h d y At thum h w la t
see h was lmost bld f m p gr f th t l
des h both ye H d d t th t H p t l
94 d th p r t y t alabl

Case 4 is a male with struma lymphomatosa and one of the few ever to be reported. He is also interesting in that he had one of the rare skin lesions pseudoxanthoma elasticum coincidental with struma lymphomatosa. This man exhibited all the clinical and pathological characteristics of struma lymphomatosa including an excellent response to x-ray. He developed marked myxedema even though only the enlarged isthmus of his thyroid was removed. Graham (26) in 1931 reported 2 males. Joll reported 3 males and Kearns reported 1 case of a male with struma lymphomatosa.

CASE 5 N 94097 CS 8y Id whit f m l h se
was as d m t t f th d t m t th St g
Mem al h p t al N m 935 H h f m p l aint
was f m d t diff la g m t f th thyr d f
years and p d gr with f l t m th w th p and
t d m ss th l f t Th th m k d as so t d
dysp d dysphagi B sal m tab h rat y bef
entry had bee - pe t Past h t ry was g t
p t f mld d p es l psych yea pri t d
muss Sh had h d r m l pregn c coem t t
dise es

Laboratory aminati h d b sal m t boli rat f
-9 pe t W s r m n eact w g t Physical
exam t n l d r m alt imperat p l s d p
rat n b l d o p es ur /80 Th thyr d was diff sely
n l rged d m th thum It was d and t d
At ope t bul t al btol thyr d ct my was pe
f m eed w th rath m ked difficulty beca f dhes
to th f t t es f th ck G ssly th gl d w fin ly
nod l to gh, firm t hard

M r sc p xamin t led mod t t m a k d
creas bb tiss Th re w lmost compl t acina
d g rat w th l t l l d M y c m l h d
co less dnt pal f amy type f l w th t es mbl
to foreign body giat lls Th re was diff infiltrati
lymphocytes th m lymph f l l cles th g r m
lce ters Th re w mod rat umb f plasm lls
A rare pseud g t cell w seen. P tope ti course w
un l f l At f llow p xamin t n basal m taboli rat
34 m ths lat was -3 pe t Three d half
m ths aft peration thyr d graft m an th p t t

d g g thyr dectomy m pl t d d tly th
f m l l th l f t gr be th th m e u n a l g h
m t Th gh ppa tly th graft w bl t mpo rly
t was m pl t ly un ess l d t 4 1/2 m ths th
w unnu tak bl signs f myx d m and th b l m t
b l rat w -35 p t Th p t th s b f ll wed
s i f 9 y rs with b sal m taboli t g f m
-3 t -4 pe c t Th blood h leat l t tum
300 m ll gr m p t E ptf t m p l
ympt m w th g f 37 y rs p t t f l w ll
d t l l d t oom ll grams f thyr d tra t
h d y N k is soft n t d d th p r s
ur ympt m

Case 5 is an enigma. She presents characteristics that make difficult her classification. Good evidence for struma lymphomatosa is her past history of diffuse enlargement of her thyroid with a low basal metabolic rate, the gross appearance of the preserved specimen, the microscopic appearance of the gland, her postoperative course of myxedema and her early menopause. One suspects the diagnosis of struma fibrosa because of her age, recent acute history superimposed on a chronic enlargement, rather marked pressure symptoms, adhesions of the thyroid at operation and rather marked fibrosis of the gland. This may be explained by a subacute nonspecific inflammatory reaction superimposed on an already existing struma lymphomatosa. With regard to Case 5 it should be noted that there was an unsuccessful attempt at a homologous type of thyroid graft in an effort to control her progressive postoperative myxedema.

CASE 6 N 40044 MW 5y Id hit school g l
w d m t d f th fifth th t th St g M m l
Hospital Sept mb 944 H h f m p l aint w d f
f n l g m t f th thyr d f se l years with as o-
ci t d th r es lght dysph g a d dysp
Sh lso t doc lly h r p p h nght k th t
rad ted t h nght G w th f h g d h d be
rap d 3 m ths bef try H b l m t b h rat h d
be und -5 pe t f th 6 y period pri t d
mss T h l t l d t m t n s w 8 d o 6
m ll gram pe t Tw y rs bef adm h had
d porad ally l t l pota m o d d d thyr d
tra t by m th H p t h t ry cal d ns l t 6
y rs bef re prese t dm t which tum diffusely
l rged g t f mod t iz was t d Oth adm
w f t nall t my tu media d b d m
pain At th l t adm ss th thyr d w some h t
tend to p lpat d th q estu f cut thyr d t
h d be raised

Laboratory exam t n how d ch l t l 8 m lli
grams pe t b sal m taboli t -9 pe t Wasse
mann acti as egati Physical exam t n
l d mod rat ly bese g l blood pass /7
t mpe t pulse a d respirati m l th rwise
g t p t f diffus ly nla g d firm g l d w th t
fixati Th gl d was bo t th times m l
At peratu b psy f isthmous ly was d N adh
w re t d Th tiss was gros ly firm w th y l
lowish ast cut urfac Microsc p exam t n howed
mod rat infiltrati n f lymphocytes th gh t h
trom am g th c m w th um lymph f l l tes and

g r m n a l c e n t e r s T h c a n i w e r e f r o m t h e m o s t p a t i e n t s d
t u l l e d w i t h c o l l d T h c i p t h l i m w d a t t e d d
r y l w c u b o d a l t y p e T h r e b h t t l b h a n
c r a s e o c c u t u s R a r e p l a s m c e l l r e c e N
g i a n t c e l l s w e r e l o s t p e r a t c r s e t f l
T h r e c e d n a m e d t l y a f t e r p e r a t 8 0 0 d e e p
r a y t h r a p y t h t n i g h t d i f t t n r c l
g i h t h y r d w t h u n w e e k s h t h y r d h d
d e c r e a s e d m k e d l y s u z w t h l i f l y m p t m S
w e e k s a f t e a d a t u n h e t h y r d h a d i n c a s e d t f m s
s i A d g l y e c o d r s f y w a s g r e
6 0 0 w r e d i c t e d t h t n i g h t d i f t i c e r c a l
p o r t H r e s p o n s g u n a s s u m d t w t h 5 p e t
e d u t i z f t h g l a d e e k T m t h s
f t p e r a t h b a s a l m t a b o l e t 3 p e t
F m t h f t e p e t u h r t h y d a s 5 p e r e t
e s n g i f a z a n d s h w h a v i n m t r u i e g u l n i t e s
S h w a s t e d t h y r d t r c t 6 5 m i l l g a m a d y
l y A g u t 0 4 t h p u t m n s e m u l d
h t h y r d g l d t h u b p l p b l a s 5 p t o f t s
n l d j m p t o m t

Case 6 is one of the youngest cases reported of struma lymphomatosa. Joll ment ons a girl aged 9 years. Bogart mentions a negro girl aged 14 years and Helliwig presents a case of a 16 year old girl. The question may justly be raised in this case as to whether this might not be an adolescent colloid goiter with focal areas of lymphoid hyperplasia. The work of Strumonds (57) showed that 40 per cent of simple colloid goiters between the ages of 10 and 20 years revealed on microscopic section areas of lymphoid hyperplasia. This fact lead one to scrutinize the diagnosis of struma lymphomatosa closely in any very young adult. However the relatively long history with recent rapid enlargement the tendency to myxedema moderate pressure symptom out of proportion to the size of the gland shootin pains to her right ear the surgical and gross appearance of the isthmus the diffuse enlargement and the great number of lymph follicles with germinal centers support the diagnosis of early struma lymphomatosa. Her response to x-ray further corroborates the diagnosis.

ST m s F b s

C 37 N A 36 A K 37 y r l d w h t f m l r
h e w i s w a s d i s m i t t e d t h s e c n d t i m t h S t g
M m n a l H p t a l i n A g u s t 0 3 H e m p t w f
g u l b l e e d i n g d d y s p n e a T h t h y r d h a d b e n i n
c r a s d s u z d b u n h e p e s d h a d e a s f
p t y r s h h a d o c c u r t c a c i m o f t h e
r v i x w i t h p e l v i n t a s t a s e s d e c r o s i w h a c a e d
d t h t h l y a l t d i n s i T r m n a l y h d y s p n e a b e
a m q u i t a c u t b t w t i t a b f e a t r e l y
d m i s s i A t p o m o r t e m e x a m i n a t i o n t h t h y r d w a s
d i f f u s e l y e n l a r g e d d b o h e i n r a s i t c i t w a s s o
d n e s l y d h r e t t h t r a c h e a a n d h a d g r w n a g u n d t h
e s o p h a g u s i n s c h m a n n t h t i t w a s f u n a t l y d i s
s e c t e d o n M o e a n d p r e s e r v e d a s m u s e u m p e c u m n

Microscop ex aminati sh wed complt fibrosis of th
g l a d t h c r a m p r e s s i o n i d e n o m a i n l b e T h
w a s r y l i t l t h y r d t i s s u e s e e n i n a n y f t h e s e c t i o n s b t
w h r e t e d t h c a n a l o o k e d f a i r l y r m a l M o d r a t

n u m b e r s f l y m p h o c y t e s r e s e d a r a p o l y m r p h o
c l a c e l l n p s e d m n t l l w r e s e e n A o c c a s i o n a l
p l a m c l l w p r e s e t
C s 8 N S o 3 A K 37 y r l d w h t f m l h s e
i f f i r s t a d m i t t e d t h S t g M m l l f p t a l
M y 9 4 4 H c o m p l t w f o c p t l h d h e a
h k g s e n a t n d e m t l t r m l f f y r d r a
t n P t h t r y e v l e d q e s t u f e a m f t h
r v i x w i t h t i m t b y s m l l m t f x r a y d
f t m t t d b p t l S h h a d
h d 3 r m l p e g n a c e s d h d h d m t l d f u l t e a
L a b o r a t y x a m t s h e d h t b l o o d t f
7 6 0 0 W a s e r m r e t m a t e P h y c l i x a m
t h e d r m l i p e t p l d e s p r a t
b l o o d p e s 9 T h y r d t y h d d f l y
l a g e d d t d
A t p e r a t b l t a l s b t a l t h y d e c t m y w p e
f r m e d T h d n s e d h e s e q g h a r p d s e c
t u d t h e s e c t i w a s p e r f o r m e d w t h g r t d f u l t y
G s s l y t h t i s s h d n d t l g t
y M o s c o p x a m n a t i h e d l o s t c o m p l t
p l a c e m t f t h y r d t s s t h f i b o s s i a b h d d
h y l u z d t A f l y n r m l p p e
h e p e s e t N u m l y m p h y t p l m l l f
p o l y m r p h l e a l l t u l t e d t h f b o p l e a
A o c c a l p s e d g r t l l a s e f t p e t
c r s n t f l

A t f l l w p m t 3 k f t p r a t b s a l
m t a b l i r t - 9 p t T h p t t a s d
m t t d m t h f g d y m p t m f l d t a y
H b l o o d l m w 4 m l l g m p t d h
b l o o d p h o s p h o a s 3 m l l g m p e t S h
d l y t l l d t m c h l d l t 8 b
e e t m t e r t h r e t i m e s d y d 5 0 0 0 t f t a m D
e a h d y A t d s c h g h i m d p h o s p h o l l
w 4 d 6 m l l g m p e t r e s p c t f
m t h f t r p e r a t h b l o o d l m d p h p h
l l w 9 d 6 m l l g m p c t d h a s
l l l e d o o t f t m D h d y l
c a l c i m g l c o t 4 u b t u m t r s t h t i m e s d y
T h h d e s t h l t r a l p e t f a c h l b e f
h t h y d h h l d o t b e s e t d t h t h u t
d r e s s S h h a s d y p h g d d y s p a d h e r t
c a b e e l y f l t h l y n t

ST m s F b r 4-G I C H t 10 t

C a s 9 N 9 4 M V 3 y l d w h t f m l
h u s e w i f w f i r t d m t t d t o t h S t g M m a l
H o s p t a l J r y 9 3 0 H i m p l a n t w f h a r p
n t p i n w t h l l g t h r i g h t a k d s l i g h t
d y s p h a g i a d d y s p n e a w t h d r u i t h a r y
i m p l i t l y g t S h h d h d 6 r m l p g c i e r
L a b o r a t r y x a m t h h d b s a l m t a b o l r a t e
f p e t h b t b l o o d t f 9 6 5 g t i v W s s
m a n n t c h m p e s s e d i n t h y b l m l h y a l
x a m n a t i l d r m l t i m p e t p h e d
e s p r a t n s b l o o d p e s f 8 0 T h r i g h t l b e f i t h
t h y r d t i m e s o r m l u s r y h a d a n d f i x e d t
t h r r d i n g t e s T h l e f t l b e w n r m l
A t p e t u g h t b t a l l b e t m y w a s d T h
r i g h t l b e w d e n s e l y d i t o t h r r d i g s o f t
t i s s e s T h l i t r m l n p p e a r a n d t p a l p a t i o n
d w a s d i t b e d T h g b t w f i r m w h i t h a d
M o s c o p x a m n a t i h e d a r y m k e d a s t u
f i b t i s s w i t h e a s f l y m p h o c y t e d o c c a s i a l
p s m a c e l l i n f i l t r a t n T h a c o m w r e m p e s s e d a n d
m a n y p p e a r e d f a i r l y r m a l t h g h a n e q u a l u m b e
w d e g e r a t e d h a d n a l e s c e d t p s e u d o g i a n t l l a
P o s t o p e r a t i o u r s e w a s u n u f u l T h w a s i m m e d i a t
y m p t m a t i m p m e n t



Fig 1 ft C N 994 A W St m lymph
m t M k d lymph d flt t d hyp pl th
d g t d r f m t t

At fl p m t 7 m th ft p t th
pat t mpt t ly ym t m f Th p t ll
d l d t th ght k l ft k rm l
Th gn f myx d m dy ph g dysp
b sal tab l t - p t

Case 9 would certainly be considered by many as a late case of struma fibrosa. Yet her relatively short acute history and the microscopic findings suggest a pseudogiant cell type of chronic thyroiditis. Five years later the right neck the site



1 st p r t b S l p t th l t Id
t l h g mp d th thos t d t f t p e t
pt th t th ly ph d t tti d sc t

of the original involvement was still hard indurated and nontender. This condition is more typical of Riedel's struma. This fact is strong evidence that struma fibrosa is really a late stage of progressive fibrosis of a chronic thyroiditis.

St m F b (G t C H l t)

C N 9498 CZ 43 J Id h t f m l
h f f t dm tt d t th St g M m l
H pt l J 94 H h f mpt t ft d

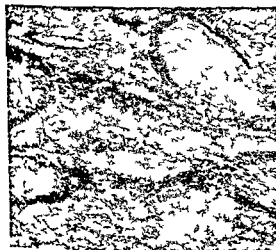
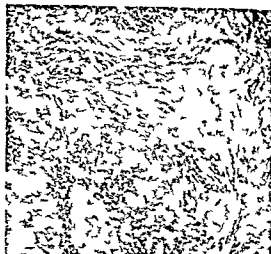


Fig 3 C se N 69460 E A Stru lymph m tosa
Cl lymph d flt t d hyp pl th
d g t m l m t f t t

Fig 3 C se N 69460 E A Stru lymph m tosa
Cl lymph d flt t d hyp pl th
d g t p es t th od t m t f



beefy t y p l y ll h g y d q t f m
M r r s c p m t h d m k d
f b t r r g d h l und p th l
th t h d g n f m k e d l g t d h a d o-
l s c d t m l l l g g t y l t
tru f g n body ll Th y f th
M l l m y be p t t g th ll
m som I th pp t t f f
g n body g i a t ll Th y lymph y t d
p m ll f th d m l t f
p l y m ph l ll f m m t f l b
Th p t th t f t d h fl m t
Post f t rs t f l P mpt l f f
ympt m b t d
At f ll p m t 3 m th ft p t th
p t t t lly ympt m f Sh h h d m
g n l g l d f f lt th th q t f p
H b s a l m t a l l t 6 m th g -8 p t t
wh h t m h w t k g f th y r d d y Th
d d t / g d y i h d l p d m l d
ympt m f m y x d m d th d s a g
d t g d y At p t 3 m th ft
p t h b l m t b l t -8 p t H
k soft th gh t Sh h y m t f d y ph
dysp

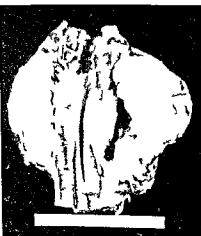


F C 7 N A 36 A K St um fib Th
h d h y l e d h t f th fib t h
Thy d p th l m l t ly r m l

CASE STUDY

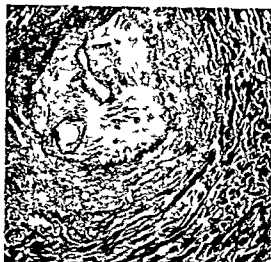
The clinical charts and microscopical sections of all the cases medical and surgical were reviewed whenever the clinical or pathological diagnoses of acute subacute or chronic thyroiditis fibrosis lymphoid or cellular infiltration or granulomatous change of the thyroid were mentioned stated or suggested. This study covered a period of 17 years during which time there were 3750 admissions for thyroid disease. The protocol and microscopic sections of 8000 postmortem examinations during this period were also studied in a similar fashion. The cases presented have all been

Cases 10 and 11 are excellent examples of the pseudo giant cell type of chronic thyroiditis described by De Quervain (13-14). The latter case is more acute than Case 10. At a casual glance at the microscopic sections one is reminded of the fibrous tissue of these cases and Cases 4 and 5 resemble. Yet the two processes are entirely dissimilar in that Cases 10 and 11 are the early stages of an acute to chronic inflammatory process. Cases 4 and 5 the end stage of a chronic degenerative process. The fibrous tissue in struma lymphomatosa is of a finer avian nature than that of struma fibrosa or its earlier more acute form in which it is hard staight and often hyaline.

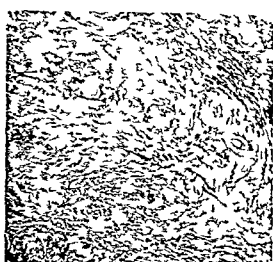


F g b Ph t g ph l f h
d l h g j h t gh h
h d h t fib l l t t h

l m t f s o r h g u d p f
l m t f t h l th pha th
f l t f t m fib



Fg 8 Case 8 N 303 Vh Strum fib osa M ked
fib os f h d h al ed h ra t P rt ri la
fib os d t m l th ck h wn A mod rat
mbe fleucocytes d lymphocytes fib pl es
A occa nal pse dom ll as ted Acini f ly
cm l pp ran

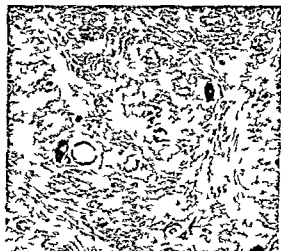


F 9 Case 9 N 94 M V Stru fib osa gr t ll
t M ked ease fib t rr ged
h l th reas f mod t hyaloi tu Mod rat
mbers fl ocytes d lymphocytes fibro pla es
Mod rat pe t l fib os N m d g t
th p th f m cm l lse h l ed es

seen personally at recall except 2. In Cases 4 and 5, the patients are dead.

After operation, a postmortem examination in many cases diagnoses of chronic thyroiditis or fibrosis of the thyroid were made because of a

slight increase in fibrous tissue of the gland or an increase in round cell throughout the stroma. There was no clinical or gross pathological collaboration of the endonoses. The microscopic pictures were probably representative of the varia-



F Case N 945 CZ Struma fib osa gr t
cell area t M ked increase in nb us. rran ed in
h l f mod ra h d nes d hyalinizat D f se
dnd focal infiltrat ns f leu ocy es and lymphocytes
Man deg rat cnu w th rmatu f tru and pseudo-
gian cells



F Case N 6340 F Strum fib osa gr t
ll riant M ked ease fib t rr ged
wh l f mod ra h d ess d hyali zat D f se
filtrat f l ocytes d lymphocytes fib us pla es
Few focal bases-es Deg rat ac f narte vol fibro-
si d t m l th k nin N m pse lous t ll



Fig. 46. 34 A.K. Foc. l. trum. lymph. m. t. post. m. t. D. th. ed. dde. ly. t. g. f. 43 by. b. l. h. m. h. g. N. y. pt. f. bl. t. thy. d. id. d. M. sc. p. p. t. d. t. gu. h. bl. f. tru. t. m. ly. ph. m. t. sa.

tions from normal with increasing age. Attention here should be called to the study of Loeb and Simpson in 1938 on guinea pigs. They noted from birth a gradual increase in fibrous tissue in amount and density. This was most marked about the arterioles and least around the lymphatics of the thyroid. Anterior pituitary hormone stimulation was capable of lessening this stroma.

It is of interest that microscopic sections of the thyroid in 4 cases not reported here showed a case identical with a true struma lymphomatosa. The sections were obtained at postmortem examination for an entirely unrelated disease. These cases are similar to those reported by Jaffe in 1938 and by Simmonds (58) in 1933. They also represent the error that can arise if one judges the cases by microscopic section only.

This small series was selected after reviewing and excluding the following groups of cases: (1) acute subacute and chronic thyroiditis of known specific etiology, (2) round cell infiltration of moderate fibrosis of thyroid gland without enlargement, asymptomatic and usually associated with intercurrent diseases, old age and debility, (3) focal round cell infiltration of struma and lymphoid hyperplasia associated with simple colloid nodules, adenomas or toxic thyroids.

An attempt has been made to distinguish between a strumitis and thyroiditis. The former is inflammation of a pre-existing pathological gland. The latter is inflammation of a normal thyroid gland. Inflammation of the latter is the nor-



Fig. 3. A373. F.H. Tru. myx. d. m. post. m. t. m. V. l. d. c. f. fib. t. f. d. ff. f. ly. g. h. t. C. m. pl. t. d. g. t. w. th. les. c. t. m. ll. ll. m. Mode. t. d. ff. se. ly. ph. d. filtra. to. th. type. pl.

mal and pathological can be differentiated easily. In a wide intermediate group, however, it is impossible to say whether inflammation precedes or succeeds pathological change in the thyroid. Thus confusion is avoided in the search for etiological agents or conditions.

Individual features that deserved emphasis in this small series of cases presented are discussed at the end of each protocol.

CLINICAL CHARACTERISTICS

This series is too small to draw any conclusions with regard to a specific clinical summary. However, when they are added to their respective groups reported in the literature they conform to the clinical peculiarities of the disease group in question. In Table I the clinical characteristics of these groups are briefly summarized.

1. Acute thyroiditis occurs most frequently in young adults. The pseudotumor cell type of chronic thyroiditis and struma fibrosa occur in the third and fourth decades of life most frequently. Struma lymphomatosa occurs most frequently in the fourth and fifth decades, though there is such a wide range and overlapping that age alone is not a valid distinguishing feature in any of the groups.

2. Fifty-six per cent of the 3,750 patients admitted to the Struma Memorial Hospital for thyroid disease were females. Thus the ratio of female to male in thyroid disease is roughly 6 to 1. The ratio of female to male in struma fibrosa is state-

TABLE I—CLINICAL CHARACTERISTICS

	rum l m b m oia	fibrosa	ru fib ma-e	ll
Age—rs	0-60	20-	0-	
Sex—fe f m l	Am oo	60-80	00-80	
Pre l m na m m	P ene f ru resure p	P ed ru an f re p	tera res re m m b	ho ll m ec d
D ra f m m ms	U ual rs w h rece tel ra	years	On m h	
Present f go				
D ra f go	U ual rs	rs	m h	
Degree f h ro d	Al d ff se	er ul ral	l l	
Response ra	Ex f	N	L k	
Pos pe	L f f	Of rm	L ual f l	
F ll	f ed m d ge ral m hol d	N m f m Oc as ll m f f es a m m	L ual m m f	rect re f
		larvneal pa		

a rou hl 3 to or 4 to 1. In struma lymphoma tosa almo t 100 per cent f the patients are females. The few e ceptions ha e been noted previously n this paper. Therefore all male with the diagno i of trum lymphomat sa ma be regarded with uspic on unless the entire cl uco-patholo ical picture is presented.

P lo i t v ptoms S mptom are varied and ften overlap but in eneral the presentin symptom in struma l mph matoa i diffuse enlargement of the thyroid. Occasionally mild pressure symptoms a e noted s ch a dyspnea d s phonia h ir eness ice chan e ti htness about the neck cou h or str dor. S ms a d symptoms of ea h m edema ma be present. Mo t common of these symptom a e wei ht ain e v fatigabilit weakne dryn ss of the skin and mild m edematou face. At t mes tremor ne ousne in omnia palpit tion ert o and symptom related t the s mpath tic and central nervous stem v be p esent. These are u lly econdary to mild pres ur v mpt ms and are n t related to h perth r fl m wh ch does not xi t. At best the c mplaint f pat nts wh th truma lymph matoa re ague w th the one ex ception th t the ha e a te and a fullness t the r th out.

W th strum nb oia th i n t true. Pre ure symptom re ma k d oiten t uch an e tent that ph i seem mm ent. Th re se m ked econd rrv nervu mpt m becau of th an x t r t created b ma k ed pnea and ch k ino sensat on. The res lt f th m be a t bel el gted basal met bol rat. P nma or m not be present but uall b ent. Th fur tin of the s mpt m i r t el b i as the se r itv brnss the pat nt t th d to n i u ll

not lon er than t to years. Ca 7 i an exception to thi rule.

With the i t cell a iant f struma fib a pain i ery ften the chi f c mpla nt nd occurs n the neck r should r with r d ati n t the homolateral ear or back of the head. In Ca 11 the chief dm ttin ompla nt wa a e pa n that sh t t the b ck of her head as oc ated w th a d flu lvenla ed thro d. These two s mpt m should l avs lead one to suspect a subacute r chro c thyroid tis. There a e fie p esure symptoms of mild e e itv as oc tel w th the enlar ed land but these a e a able. Operat on is often undertaken ithin a fe eeks f the n set becau e of the p o ss on i p essu e s mpt ms and the presenc of n enla d i be l bes f the thro d h e ha dne s u e ts m l nancy.

Summar n the c mplaints presented by these three clinicop th l ocal group in quest n stru ma l mphom tosa char cter ed by a d flu nlar e ment usu ll of l n stan l n w th ague s o i t d compl nts. Struma hb sa i ma k ed by pr dore anc t p s re mpt ms w th ca nal condary nerv s mpt ms and no tende c t r m d m el m. Th gra t ll a ant f trum fibrosa ch a ter d t cute p a i n n k r sh lde radi t e s de f the h d a d a nla el iten t der g iter. A p t v t of d Strumal mph ma t s esp nd call t theraj. Thi i t c t a i to the la k f re j use t trum f b oia. The j n f p l t ell chr c th d t i s unk n. A theraj m l m x t b used a diagn t test t m l m p m to a p r d l th t a p l m t f p ha b take t rule t m l m.

TABLE II—PATHOLOGICAL CHARACTERISTICS

	Struma lymphomatosa	Struma fibrosa	Struma fibrosa-gland
General appearance	Pseudobulbous	Whitish	Grayish
Etiology	Various	Diverse	Unknown
Adenoma	Fibrous	Adenoma	Adenoma
Endocrine	Normal	Normal	Normal
Cancer	Fibrous	Fibrous	Fibrous
Pressure	Normal	Normal	Normal
Autopsy	Diagnosis	Diagnosis	Diagnosis
Collapsibility	Scarcely	Normal	Normal
Size	Large	Small	Small
Color	Dark	Light	Light
Blood vessel	Normal	Normal	Normal

Ioslope at the confluence. In general with or without operation cases with struma lymphomatosa tend to become myxedematous and must be supported by thyroid extract. Struma fibrosa and its giant cell variant seldom cause myxedema provided that enough normal thyroid tissue has been allowed to remain after thyroidectomy. However, in struma fibrosa pressure symptoms are apt to progress and there is often a gradual hardening and induration to vary in the periphery of the lobes where resection was incomplete and as such these two groups are indistinguishable months or years after operation. The giant cell variant of struma fibrosa may subside spontaneously if left alone though its symptoms may be so annoying that operation can be justified. In conclusion the fact that recovery of the cases of any of the three groups has elapsed secondarily is ample evidence that they become tertiary with regard to their mechanical effects. Moreover, the effects can usually be alleviated by one operation. Struma lymphomatosa alone progresses slowly locally however as has been noted.

Lab tests. Laboratory examination offers little diagnostic aid with the exception of the basal metabolic rate which is normal in the majority of cases. In struma fibrosa the giant cell variant and also in struma lymphomatosa if the basal metabolic rate is quite low the blood cholesterol may be elevated. An examination of the constant features of the three marked cases of McSwain and Moore state that there is a relative lymphocytosis in the blood measured by the

struma lymphomatosa without elevation of the white blood cell count. The Wassermann and tuberculin tests are no different than would be expected in any group of people and are not a constant feature in their results. Cultures and bacterial smears of the thyroid have been constantly negative.

Pathology. In considering the pathology of these groups one should correlate the findings at physical examination, the gross surgical pathology, and the microscopic report.

Physiology. In struma lymphomatosa the glands diffusely firm occasionally it is described as hard. The largest gland described by McSwain was 177 grams. Often it is fixed to the trachea on allowing the gland is seldom tender. It may be asymmetrical in its enlargement but Jell states the normal thyroid is often asymmetrical in its development and occasionally a gland is slack. The fact can explain the symmetrical enlargements of Case 1 and the markedly enlarged isthmus that was removed in Case 4. In struma fibrosa and the giant cell form of chronic thyroiditis diffuse enlargement occurs in about 70 per cent of the cases. It is localized in the more lobes in the remainder. If the examination is carried out with care first attention to the tissues immediately noted. The gland is not tenaciously held together by a fairly constant feature in the chronic thyroiditis. In none of these forms a bruit heard. Nodules are very rarely felt and are common in the latter are rarely palpable. They were absent on surgical exposure.

Th is an important different al po nt from a malignant lesion Remonal lymph n des are seldom enlarged

Gross pathol The gross appearance of the gland corroborates a careful physical examination with regard to size shape and consistency of the gland In struma lymphomatosa the diffuse enlargement may proceed posteriorly in such fashion as completely to encircle the trachea The diffuse involvement includes all prolongations and extensions of the gland The surface of the gland is smooth pinkish in color with a pseudobulbar or bosselated appearance The cut surface appears finely lobular with a yellowish cast that is characteristic The areolar adjacent adhesions except a thickening in some instances of the normally existing pretracheal attachment The land firm in consistency at operative exposure though it may feel hard to preoperative examination The amount of bleed n is variable t operation

In struma fibrosa the gross appearance is characteristic The gland is white glistening smoothly enlarged extremely hard avascular except where fibrous tissue maintains the patulousness of a large vessel and densely adherent to surrounding soft tissue and pretracheal muscles The gland cuts with difficulty and resection is often physically impossible except by continual sharp dissection without identity of adjacent structures nerves or vessels As in Case 7 the esophagus may be completely surrounded when no case of true struma fibrosa is this a characteristic sticking unless a lobe is uninvolved In 30 per cent of the cases the process is localized to one or two lobes of the thyroid Frequently the fibrous enlargement of a lobe will encapsulate and compress a colloid adenoma as was true in Case 7

The gross pathology of a pseudotumor cell thyroiditis is very similar to a struma fibrosa in shape consistency and extent of involvement except that the former lacks adhesions to the surrounding soft tissues and if present they are less dense Very frequently however a perithyroiditis is described in operative technique in which thickening of the capsule and an induration of surrounding tissue is noted This picture has been given particular emphasis by De Courville (1) and will be discussed later under etiology

Microscopic In this description the structure and appearance of the acinar epithelium the presence or absence of colloid the appearance and degree of fibrosis in the stroma of the gland the character of infiltrating cells and the state of the blood vessel warrant careful consideration

Struma lymphomatosa presents a diffuse and uniform denervation of the acinar secretory dendritic

by a flattening of the epithelium to a very low cuboidal type with eccentrically placed dark nuclei The acini shrink in size and become small They have a tendency to coalesce with the formation of pale deenerated cells Colloidal content is absent Rarely does one see a faintly formed by an admixture of remaining colloid and acinar epithelial cells Occasionally depending on the level of the section with regard to the thyroid capsule one sees an intracapsular mass of desquamated epithelial cells and colloid if such is present One sees constantly an increase in fibrous connective tissue surrounding the lobules of deenerated acini This increase in amount as the disease progresses continues Often in the late stages one may see a complete fibrous replacement of whole lobules However this fibrous tissue is of a finer wavy texture that serves to distinguish it from the hard coarse type found in struma fibrosa The arrangement of the fibrous tissue is as wavy characteristically wavy in relation to the lobules In the late stages of the disease and is often confused with the early appearance of the fibrous tissue in the giant cell variant of struma fibrosa Here however as in struma fibrosa the fibrous tissue is hard and coarse Undoubtedly the apparent similarity has been the cause for many writers to consider the two as one disease process There is a diffuse infiltration of lymphocytes throughout the gland in all cellular planes and between the acini There are numerous areas of lymph follicle with their characteristic germinal centers composed of large lymphocytes and reticulum cells with their mitotic figures Plasma cells are occasionally seen Leucocytes are abundant with difficulty if at all Large mononuclear cells are occasionally seen as is rarely seen a pseudomalignant cell which has been described The cell is no endarteritis or thickening of the membrane of the acini in struma lymphomatosa and the cell is of an unusual vascular type of the gland

Struma fibrosa presents a striking picture of a hard dense highly indurated fibrous tissue and little else at a cellular level On further inspection one may note the presence of epithelial elements in the stroma In the normal thyroid however there is usually complete absence of acinar epithelium When present in the uninvolved areas the acini appear fairly normal with varying sizes and cell differentiation of the epithelium usually normal cellular body type without central placement of nuclei The secretory merous hyaline and immunatory cells in the haemorrhaged thyroiditis and other diseases The mononuclear cells in the capsule look like a dendritic cell of the process In the late stages of struma

fibrosa these infiltrating cells are less frequent. Scattered lymphocytes are most frequent. There are no germinal centers or areas of hyperplasia. Occasional leucocytes are seen. Plasma cells and wandering monocytes are seen in varying numbers. Occasionally pseudogiant cells are seen though even these are very rare or absent in the late stage which in brief shows little else but fibrosis. The arterioles show a thickening of the intima and media and the vessels are surrounded by a cuff of fibrosis in most instances.

The giant cell variant of struma fibrosa presents a much wilder picture microscopically. There is an acute degenerative process in the acinar epithelium and often in one low power field many stages of this degeneration may be seen. Acini appear normal in uninvolved areas. These stages of degeneration vary from only hyperchromatic nuclei to a clefting of epithelial cells with the formation of an intracellular cell mass or a pseudogiant cell. As the acinar epithelium degenerates the continuity of the wall of the vesicle becomes lost. First it thins in one area then proceeds to a more complete breaking up. Colloid is often left in open tissue spaces. In some areas large monocytes may be seen penetrating these cellular aggregates. In other areas where no colloid is present and no acinar epithelium can be distinguished these pseudogiant cells are indistinguishable from true foreign body cells of the Langhans type. In fact ultimately these cellular aggregates that include acinar epithelium, monocytes and colloid may be true foreign body cells. This could result from absorption of the colloid and degenerate epithelial cells by the accompanying monocytes. This conclusion is borne out by the fact that in the late stages these giant cells have fewer nuclei than the earlier aggregates of cells. There is a marked increase in fibrous tissue that is hard, coarse and often hyalinized though to a lesser degree than in struma fibrosa. It is arranged in characteristic lobular whorls and is to be distinguished from the late fibrosis of struma lymphomatosa as mentioned.

Interspersed are numerous lymphocytes and plasma cells. Occasional eosinophils can be seen. In areas numerous leucocytes are present and focal necrosis is suggested. No bacteria, spores or micro-organisms of any sort are seen that might implicate some specific etiology.

The small arteries and precapillary arterioles uniformly show thickening of the intima and media, particularly if a silver tissue stain is used. This fact is very beautifully demonstrated by German using the Hortege silver gold impregnation technique. It is also emphasized by De Courcy (11, 12).

Thus in these three clinicopathological groups irrespective of their relationships certain pathological characteristics are present. In struma lymphomatosa diffuse enlargement of the thyroid with dense lymphocytic infiltration and hyperplasia associated with degenerate acini may be seen. In struma fibrosa there are the dense peripheral thyroid adhesions and diffuse fibrosis. In the giant cell variant of struma fibrosa one notes particularly the presence of cellular aggregates resembling foreign body giant cells with acute degeneration of the acini giving the gland a granulomatous appearance.

Pathogenesis and etiology. Little has been concluded about the relationship and etiology of these diseases. With regard to the relationship of struma lymphomatosa and struma fibrosa there are three trends of thought. First they are the early and late manifestations of the same disease process (Ewing, Heyd, Collier). Second they are different manifestations of the same process (Eisen, 17, Womack). Third they are separate and distinct pathological groups (Hashimoto, 30, Graham, 25, 26, 27, McClintock and Wright, Clute *et al.*, Harry Lee, Joll, Hellwig, McSwain and Moore). Throughout this paper emphasis has been placed on the latter view so that a restatement of their differences is unwarranted. Yet to consider the two entities one must have a concept of different etiologies.

Therefore the relationship of the so called pseudogiant cell thyroiditis to struma fibrosa is worthy of further attention. This brings up the entire subject of bacterial thyroiditis and toxic thyroiditis. It seems logical to conclude that the distinctions made in these groups are not justified.

When one considers the anatomical location of the thyroid, its rich blood supply, its proximity to the throat and nasal passages, it undoubtedly becomes contaminated frequently with bacteria of the flora of the mouth and nose and by bacteria from distant points with infections. The rich blood supply of the thyroid in general prevents bacteria from propagating. Thus the presence of an abscess on the one hand with a specific organism isolated and an acute nonsuppurative thyroiditis on the other are in a large measure the result of the balance of the virulence of the organism and the resistance of the host. Usually because of the rich blood supply focal or large abscesses seldom develop. Thus as Crotti stated a bacterial nonsuppurative thyroiditis is only a phase of a process whose last act is suppuration and there is no way of telling beforehand which way a given process will turn. If there is a pre-existing area of disease as a colloid adenoma this would ob-

viously be a *loci minoris resistentiae* and such a gland would be more susceptible to an inflammation of the suppurative or nonsuppurative variety. Numerous organisms have actually been identified in specific suppurative thyroiditis including the streptococcus, the staphylococcus, *Bacillus coli*, *Bacillus typhosus*, and the pneumococcus. This supports the fact that the thyroid is often inoculated bacterially. It is well known that the blood stream will sterilize itself with surprising alacrity after showers of bacteria of different type by injection or from septic foci. Often the only clinical manifestation will be a chill and fever. Therefore in the thyroid these same conditions exist. After contamination with bacteria via the blood stream or lymphatics the thyroid becomes sterile because of its rich blood supply. Only the local toxic effects of the bacteria or their exotoxins on the acinar epithelium remain. The condition results in the so-called toxic nonspecific thyroiditis which may be of a mild or severe nature and may regress with few clinical symptoms or may progress. With marked acinar destruction and release of colloid a second group of irritating substances are freed in the intercellular spaces, namely, thyrolobulin and degenerate nonviable epithelium. These substances must be resorbed. Whether a proteolytic enzyme in the colloid exists, whether it is activated if existent, and whether it exerts an inflammatory effect if existent remain a question. Recent research suggests the presence of such an enzyme. This secondary process of repair and resorption is long and may or may not be attended with fever and toxic clinical symptoms. The end result is replacement fibrosis of the locally damaged areas. As De Courcy (11, 12) has emphasized there is often a local perithyroiditis noted at the time of operation which he believes creates a periaarteriolar fibrosis with thickening of the arterial intima and media. This condition may produce a compensatory fibrosis of the thyroid gland. He has compared this with Goldblatt's description of a compensatory fibrosis of the kidney after constriction of the renal blood supply. Thus in addition to a replacement fibrosis of damaged lobules there may be a secondary compensatory fibrosis of the gland of a progressive nature.

Inflammation of the thyroid by a specific filterable virus is a possibility, but there is no evidence for or against such an agent at present.

This concept of the inflammatory origin of struma fibrosa and its giant cell variant is borne out experimentally. Chemical poisons such as phosphorus and silver nitrate cause a toxic thyroiditis with a histologic picture of acinar degener-

ation, desquamation of epithelial cells, scanty colloid, and chronic acute cellular infiltration. De Quervain found that the introduction of bacterial toxins into the general and thyroid circulation had similar effects. De Quervain noted that the injection of a pure culture of bacteria into the artery of the thyroid could pass through without effects or might cause the disappearance of colloid, desquamation of the epithelium, and leucocytic infiltration.

Further, there is a relation of the thyroid to infectious diseases in man. Sokoloff and Muller independently in 1896 first showed that in acute infectious diseases fatty degeneration of the acinar epithelium occurred with desquamation. Rover and Garnier in 1900 examined the glands of people dying from acute infectious diseases and came to similar conclusions as in almost every case marked microscopic changes occurred of a proliferative or a degenerative nature or both. In patients dying of tuberculosis a more dense sclerosis was noted leading to the conclusion that the denser fibrosis was due to tuberculous toxins. Similar results were reached later by De Quervain. Sarbach concluded after investigation of 67 cases that acute infections may produce thyroid histological alterations, their increase in size and number of alveolar cells, their degeneration and desquamation, liquefaction, diminution of the colloid, and hyperemia. The connective tissue remains intact. Esmonet found in cachectic conditions such as carcinomatosis, tuberculosis, and leukemia that epithelial elements underwent a fatty degeneration. Gell's report on 26 thyroids examined from children dying of scarlet fever found similar changes to those noted.

Thus in addition to a direct local effect of bacterial toxins and bacteria on the thyroid there is a response of the thyroid often in a degenerative form to systemic diseases. This response is to be expected because of the thyroid's rôle in the regulation of metabolism which is altered by these diseases. Those who feel that struma lymphomatosa and struma fibrosa are different manifestations of the same process may cite this as evidence in that struma fibrosa may be the result of a direct infection of the thyroid gland and that struma lymphomatosa represents the degenerative response of the thyroid to the thyroid disease. Perhaps this may rarely occur and may be the explanation of the etiology in Case 4, a male, but if so the incidence of males to females should almost be equal in struma lymphomatosa.

The etiology of struma lymphomatosa is more obscure. As Jell concluded, struma lymphomatosa

appeared to be neither inflammatory neoplastic nor degenerative in any way comparable with what is usually understood pathologically by such terms. The stimulus for the characteristic picture of diffuse lymphoid infiltration is difficult to account for. In fact the function of lymphoid tissue in general remains a mystery. Maximow states that the lymphoid tissue responds to local injury, is related to the extramedullary formation of lymphocytes and is related to the formation and function of macrophages.¹ Lymphoid tissue is rarely seen in normal thyroids of young adults but is more frequently witnessed in apparently normal thyroid glands of older adults over the age of fifty (Simmonds 57). It may be a response to a local degenerative process.

The fact that struma lymphomatosa occurs almost entirely in women in the fifth and sixth decades of life with an associated progressive tendency to myxedema seems to indicate a degenerative process in contrast to a neoplastic or inflammatory process. The thyroid is subject to excessive functional demands in women throughout their period of sexual activity, namely puberty, menstrual cycles, pregnancies and the menopause. It seems logical to conclude that through the years the gland burns itself out and the lymphoid infiltration and hyperplasia is a compensatory and replacement process for the slowly degenerating acini. The rather rapid hyperplasia locally of the lymphoid tissue often suggests great intrinsic almost neoplastic activity though not sufficient to relate it to any form of malignant degeneration as mentioned by Graham (26). Whether this degenerative process is preceded by an initial hyperplasia and toxic reaction remains a question. Some contend that this always occurs and thus they explain the focal areas of lymphoid tissue in a toxic goiter.

Boyden, Collier and Bugher are of the opinion that iodine ingestion is a possible factor. However in many cases no history of iodine ingestion is present. Furthermore few patients have thyroid disease of any sort who do not get iodine rightly or wrongly at some time or other in the course of their disease. The frequency of its administration particularly in struma lymphomatosa is evidence of its chronicity and cannot be considered justly as an etiologic agent.

Det has been considered. McCarrison produced a lymphadenoid goiter in 25 per cent of his

rats on a vitamin deficient diet. He fed potassium iodide salt. He suggested that a vitamin deficient diet was a possible etiology in man for struma lymphomatosa. His work is very interesting and may be significant though in many cases no history of dietary insufficiency is to be found.

One interesting discussion of etiology is that of Hellwig. He felt that overstimulation of the thyroid by the pituitary thyrotropic hormone was responsible for its involution and degenerative changes. He aptly makes the comparison of the microscopic appearance of struma lymphomatosa to chronic cystic disease of the breasts. The work of Uhlenhuth in 1926 showing that the colloid release phase is affected by the thyrotropic hormone is emphasized by Hellwig. This work has been carried a step further by the experiments and microdissection of the thyroid follicles of rats by De Robertis in 1941 and by Dziemian in 1933 at Johns Hopkins. They found that the proteolytic enzyme factor in colloid was affected by the thyrotropic hormone. Administration of thyrotropic hormone caused a decrease in the viscosity of the colloid thus facilitating its release.

The end result of a rather large amount of speculation and very little actual research is essentially that the etiology of struma lymphomatosa is unknown. Because of this one cannot state with definiteness its precise relationship with any of the existing known diseases of the thyroid gland. Thus one must continue to regard struma lymphomatosa as a clinicopathological entity of unknown etiology, and not for the present at least a specific disease. Struma fibrosa on the other hand seems quite definitely from the cases studied and from reports in the literature to be the result of an inflammation of the thyroid of a bacterial origin. The pseudogiant cell type of thyroiditis described by De Quervain does not seem to be a disease *sui generis* as he maintains but one variant of the protean manifestations of the thyroid gland to inflammation of bacterial origin.

DIFFERENTIAL DIAGNOSIS

Obviously the most important differential diagnosis for these groups is from malignant growths. Due to their infrequent occurrence one's first acquaintance with the disease is often at the operating table. The question of malignant growth has either been raised clinically preoperatively or imposes itself on exposure of a firm or hard gland. In mistaken diagnosis of malignancy the surgical error is usually one of commission and not omission. There is an attempt made at total excision of the thyroid with often unilateral or bilateral damage to the recurrent

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laryngeal nerves parathyroid tetany myxedema or varying combinations of these complications. One case is known in which all the complications occurred postoperatively. Complete resection of a struma fibrosa is usually mechanically impossible. Complete resection of a struma lymphomatosa is technically easy but unnecessary and actually very undesirable from a physiological point of view. Therefore to endanger the patient's well-being and even life by a total resection of the gland is not justified except on a definitely positive diagnosis of malignant lesion supported by microscopic section.

The differential features are easy to describe but often difficult to apply when there is a specific case in question. In general cancer occurs in 1 to 2 per cent of all thyroidectomies. It is rare for a cancer to occur in a previously normal gland. Cancer usually occurs between the ages of 40 and 60 with wide variations; however and with twice the frequency in females. Usually the malignant tumor is nodular with an irregular surface contrasted to the diffuse smooth enlargement in these groups of cases. There is frequent invasion of adjacent tissues with regional lymph node involvement. This condition may be quite difficult to distinguish from a late hard struma fibrosa. However the differences of the later process are often confined to one lobe and its excessive hardness serve to differentiate it from a malignant tumor. If the clinician doubts on review of the clinical history, gross pathology or even frozen section it is advisable to wait for permanently stained microscopic sections.

TREATMENT

Treatment should be aimed at relief of symptoms. A positive diagnosis is essential. Thus biopsy irrespective of the form of treatment should be carried out as a preliminary procedure if there is any question of the diagnosis at operation or if treatment solely by x-ray is contemplated.

In general the best results are obtained by the most conservative means. The use of x-ray only following biopsy has given excellent results in struma lymphomatosa. It may almost be used as a diagnostic test. The response is rapid and the gland will shrink markedly in size in 2 or 3 weeks. A red um collar has been described by Renton and associates. Deep x-ray of high enough voltage is sufficient up to 100 to 1500 r on each side of the neck in divided doses of 100 to 200. Time must be allowed to elapse between courses of radiation to allow for skin tolerance of the amount of radiation given. In Case 4 the patient had a permanent

regression of the gland after 800 r to each side of his neck anteriorly. In Case 6 the patient had an immediate response to the same amount 800 r within 2 weeks but she had a recurrence of the size of her thyroid after 6 weeks. She received another course of 600 r with excellent results.

The effect of x-ray therapy on pseudomalignant cell thyroiditis may be sufficient to warrant its use. However it is hard to evaluate as this earlier more acute form of thyroiditis often subsides spontaneously and without operation. X-ray therapy is ineffective for the late stages of fibrosis described under struma fibrosa.

Surgical treatment is carried out for one reason—the relief of the mechanical effects of the enlarged or fibrous gland. In struma lymphomatosa the patient is usually in a hypothyroid state. Therefore the less subnormal tissue removed the better for functional reasons provided that sufficient tissue is removed to relieve mechanical symptoms. Furthermore struma lymphomatosa may have a tendency to regress after a number of months. Case 3 is an example in which the maintenance dose of thyroid is now much less than immediately after operation. In far advanced struma fibrosa removal of a strip or wedge of tissue overlying the trachea is all that can be physically accomplished in many cases without undue danger to the patient. The amount of tissue excised of course depends on the findings with each patient. With pseudomalignant cell form of chronic thyroiditis with fewer perithyroid adhesions subtotal excision of a lobe or lobes or the removal of a wedge of tissue over the trachea is much easier. One should remember however that normal tissue need not be excised and that the disease usually spontaneously regresses. Therefore excision of involved tissue in all cases should be as conservative as possible.

With regard to the actual technique of surgery little need be said. The potential complications have been mentioned. Because of the greater mechanical difficulties in surgery on thyroid glands with marked fibrosis and adhesions to surrounding soft tissues the frequency of these complications is greater. For this reason one must use extreme care particularly with regard to the recurrent laryngeal nerves. Damage to these nerves undoubtedly the cause for frequent tracheotomies in many of the earlier cases reported and not because of a protraction of the disease. The entire purpose of the operation—relief of obstruction to an airway—is defeated when one or both of these nerves are cut. Acute asphyxia may occur when paralyzed vocal cords are added to an already embarrassed airway. Therefore

for the postoperative safety of the patient the vocal cords should be inspected upon conclusion of the operative procedure as well as between stages of the operation when it is in progress. Tracheotomy may thus be anticipated and actually performed if necessary thus reducing the risk of asphyxia to the patient. The use of an intratracheal tube for administration of anesthesia may be a necessity for an adequate airway if general anesthesia is used.

The results of surgery in general are good. This is borne out by the fact that so few cases have had second operations. The patients with struma lymphomatosa almost invariably need supportive thyroid extract irrespective of the amount of the gland excised though less thyroid extract will be necessary if more thyroid tissue is allowed to remain. In the more acute forms of thyroiditis with out marked fibrosis relief of symptoms is usually quite prompt and permanent. As one might expect the results of surgery in a late struma fibrosa are often poor. The poorer end results are primarily because of the nature of the pathology and secondarily because of postoperative surgical complications of recurrent laryngeal nerve paralysis, parathyroid tetany and occasionally myxedema.

SUMMARY CONCLUSIONS

Riedel first described a diffuse fibrosis of the thyroid in 1896. In 1904 De Quervain first described a giant cell type of thyroiditis. In 1912 Hashimoto described a diffuse struma lymphomatosa. Since these original descriptions there has been much confusion of case reports though at present struma lymphomatosa is considered by most a clinicopathologic entity despite the weight of Ewing's opinion to the contrary. Struma fibrosa and its giant cell variant have been confused in the literature and no attempts have been made to present their relationships.

Eleven cases are presented with clinical and pathological evidence to support their diagnosis. Six cases were diagnosed struma lymphomatosa, 2 cases were diagnosed struma fibrosa and 3 cases represent the earlier more acute giant cell variant of struma fibrosa.

The three small groups of cases are discussed separately to emphasize their relationships similarities and dissimilarities. Their clinical and pathological characteristics are summarized in Tables I and II.

Struma lymphomatosa is considered a distinct clinicopathologic entity. Its etiology is unknown though it is considered a degenerative disease in contradistinction to a neoplastic or inflammatory

disease. The excessive demands on the thyroid during the sexual life of the female are considered fundamental in the etiology of this disease. The excessive demands may be mediated through the hypophysis.

Struma fibrosa and its giant cell variant are considered two late manifestations of the thyroid from an acute to chronic inflammatory process. The fibrosis of the gland is considered first a replacement phenomenon of damaged glandular tissue. In later stages the diffuse infiltrating type of fibrosis may be due to a compensatory mechanism through constriction of the arteriolar blood supply of the gland from a coincidental perithyroiditis.

The pseudogiant cells are merely evidence of the more acute nature of the inflammatory process which may regress or more rarely progress to a diffuse infiltrating fibrosis.

Emphasis is placed on the protean manifestations of the thyroid gland to inflammations resulting from bacterial, systemic disease and poisons. By nature of its rich blood supply suppuration is rare. The role of a virus as an inflammatory agent is yet undetermined.

The important differential diagnosis is from malignant growth.

Treatment of struma lymphomatosa by radiotherapy is the method of choice after a preliminary biopsy.

Surgery of struma fibrosa should be as conservative as possible. Its purpose is the relief of mechanical effects only as this disease is not neoplastic. Radiotherapy may be effective in the earlier more acute giant cell variant of struma fibrosa. The risk of operative complications of parathyroid tetany and recurrent laryngeal nerve paralysis is markedly increased in any radical attempt at extirpation of the gland and nullifies any potential relief of preoperative mechanical obstructive symptoms to the airway of the patient.

The end result of treatment barring surgical complications is usually good though with struma lymphomatosa there is a progressive tendency to myxedema.

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ADENOMA OF THE BRONCHUS

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BRONCHIAL adenoma is one of the most interesting of the lesions involving the tracheobronchial tree. Mueller in 1882 described the first case of bronchial adenoma. His patient had complained of hemoptysis and expectoration of purulent material for 8 years. At postmortem examination a pedunculated adenoma was found in the left main bronchus with numerous bronchiectatic cavities distal to the neoplasm. Very little attention was paid to this interesting type of tumor until Reisner in 1928 reported a case of polypoid adenoma of the right lower lobe bronchus. Since then there has been a rapidly accumulating literature dealing with this tumor. The development of modern diagnostic methods has facilitated a more thorough study of these neoplasms and it has been found that they are not so rare as once was thought. There still exist marked differences of opinion among observers as to whether bronchial adenomas should be classified as benign, potentially malignant or actually malignant tumors. There also exist differences of opinion as to the most satisfactory method of treatment. In order to aid in the better evaluation of these problems we are presenting our experience in 38 consecutive cases of adenoma of the bronchus encountered at the Mayo Clinic.

CLINICAL FEATURES

In contrast to bronchiogenic carcinoma which occurs more frequently among men more than 40 years of age adenoma of the bronchus is usually reported to be most common among women less than 40 years of age. In Brunn and Goldman's series of 4 cases of adenoma of the bronchus 64 per cent of the patients were women and the average age was 27 years. Clerf and Bucher have reported 35 cases in 54 per cent of which the patients were women and in 43 per cent of which they were between 20 and 30 years of age. Mason and Coberth collected data on 60 cases from the literature and found that 70 per cent of the patients were women. In our group of 38 cases 22 (57.9 per cent) of the patients were women and 16 (42.1 per cent) were men (Table 1). The average age of the patients was 37 years and 18 (47.3 per cent) were less than 40 years of age. It is of interest

to note that the average age of the men who had adenoma of the bronchus was 35.3 years and that of the women 38.5 years.

Adenoma of the bronchus is characterized by the fact that it is usually slow growing and the initial symptoms and physical findings are of such a nature that the condition is often allowed to go a considerable period before being recognized. In one of our cases the patient had no specific pulmonary symptoms the lesion having been discovered during the course of a routine roentgenographic examination of the thorax and in another case the condition had existed for 8 years before being diagnosed. In our series of cases the average duration of symptoms was 26 months before the diagnosis was established. This is in marked contrast to the experience of 2 of us (Moersch and Tinney) with carcinoma of the bronchus in which we found that the duration of symptoms before the diagnosis was established was less than 8 months.

The symptoms produced by adenoma of the bronchus may be quite variable. Wessler and Rabin Laff and Jackson and Konzelmann mentioned hemoptysis as the cardinal manifestation of a bronchial adenoma. The hemorrhage is usually described as being characterized by sudden onset and abrupt termination without much blood streaking of the sputum between the attacks. Bleeding was present in 54 per cent of our cases but was an initial symptom in only 22 per cent. In no instance was the character of the hemoptysis different from that caused by any other type of intrabronchial lesion. Clerf and Bucher and Goldman and Stephens have noted that the hemoptysis may be more prominent during menstruation than at other times. We have not observed this phenomenon.

In our experience cough has been the most frequent symptom associated with adenoma of the bronchus. It occurred in 85 per cent of our cases. In the early stages of the disease the cough is non-productive. As the tumor enlarges it gradually obstructs the bronchus interfering with the normal bronchial drainage and eventually causing atelectasis of the distal portions of the affected lobe. When this region of atelectasis secondarily infected the cough becomes productive of purulent sputum. The occurrence of preceding

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TABLE I—SUMMARY OF THIRTY EIGHT CASES

Case	Age	Treatment	Survival	Brother involved
M	5	Pneumectomy	mos	Right upper lobe
F		Pneumectomy	†	Right lower lobe
F		Pneumectomy	mos	Left upper lobe
F		Pneumectomy	rs	Left main
F		Pneumectomy	†	Left upper lobe
6 M		Pneumectomy		Left lower lobe
F	5	Pneumectomy	Died	Right upper lobe
8 M		Pneumectomy		Right upper lobe
F		Lobectomy	†	Right lower lobe
F	5	Pneumectomy	†	Left lower lobe
F		Diathermy and radium	Died	Right main
F		Lobectomy	6 mos	Mid left lobe
F		Lobectomy	8 mos	Right lower lobe
F		Lobectomy	mos	Left lower lobe
M		Lobectomy	mos	Mid left lobe
6 F	5	Diathermy and radium	5 yrs	Right lower lobe
M		Diathermy and radium	rs	Right lower lobe
3 M		Diathermy and radium	8 yrs	Right main
9 F	5	Diathermy and radium	yrs	Left lower lobe
N	55	Diathermy and radium	Died	Left lower lobe
F		Diathermy and radium	rs	Left lower lobe
F		Diathermy and radium	yrs	Left upper lobe
3 F		Diathermy and radium	mos	Left lower lobe
F	5	Diathermy and radium	26 mos	Left main
M		Diathermy and radium		Right lower lobe
M		Neurectomy	Unk. wa.	Right lower lobe
3 F		Neurectomy	rs	Right lower lobe
F		Diathermy and radium	rs	Right lower lobe
F	6	Diathermy and radium	yr	Right lower lobe
F	44	Diathermy and radium	yrs	Right main
F	6	Diathermy and radium	yrs	Right main
F		Diathermy and radium	8 mos	Left main
34 F		Neurectomy	rs	Right lower lobe
F		Neurectomy	yrs	Right lower lobe
F		Diathermy	mos	Left upper lobe
F	20	Diathermy	mos	Right lower lobe
F		Diathermy	10 days	Left upper lobe

*The first cases in this table are the same as those in Table II. They are listed in the same order. †Alive shortly after operation. No report necropsy.

TABLE II—ADENOMA OF LUNG PATHOLOGIC FINDINGS IN CASES IN WHICH LUNG WAS AVAILABLE FOR STUDY

Case	Size (cm)	Brochial	Character	Findings
		Yes	Modern pneumonia	Mid
8		No	Modern bronchiectasis	Left bronchiectasis
5	1.5	Yes	Modern pneumonia	Left bronchiectasis
		Yes	Modern pneumonia	Left bronchiectasis
6		Yes	Modern pneumonia	Left bronchiectasis
7	1.5	Yes	Modern pneumonia	Left bronchiectasis
8		Yes	Modern pneumonia	Left bronchiectasis
		No	Modern pneumonia	Left bronchiectasis
9	1.5	Yes	Modern pneumonia	Left bronchiectasis
10	1.5	Yes	Modern pneumonia	Left bronchiectasis
11	1.5	Yes	Modern pneumonia	Left bronchiectasis
12	1.5	Yes	Modern pneumonia	Left bronchiectasis
13	1.5	Yes	Modern pneumonia	Left bronchiectasis
14	1.5	Yes	Modern pneumonia	Left bronchiectasis
15	1.5	Yes	Modern pneumonia	Left bronchiectasis
16	1.5	Yes	Modern pneumonia	Left bronchiectasis
17	1.5	Yes	Modern pneumonia	Left bronchiectasis
18	1.5	Yes	Modern pneumonia	Left bronchiectasis
19	1.5	Yes	Modern pneumonia	Left bronchiectasis
20	1.5	Yes	Modern pneumonia	Left bronchiectasis
21	1.5	Yes	Modern pneumonia	Left bronchiectasis
22	1.5	Yes	Modern pneumonia	Left bronchiectasis
23	1.5	Yes	Modern pneumonia	Left bronchiectasis
24	1.5	Yes	Modern pneumonia	Left bronchiectasis
25	1.5	Yes	Modern pneumonia	Left bronchiectasis
26	1.5	Yes	Modern pneumonia	Left bronchiectasis
27	1.5	Yes	Modern pneumonia	Left bronchiectasis
28	1.5	Yes	Modern pneumonia	Left bronchiectasis
29	1.5	Yes	Modern pneumonia	Left bronchiectasis
30	1.5	Yes	Modern pneumonia	Left bronchiectasis
31	1.5	Yes	Modern pneumonia	Left bronchiectasis
32	1.5	Yes	Modern pneumonia	Left bronchiectasis
33	1.5	Yes	Modern pneumonia	Left bronchiectasis
34	1.5	Yes	Modern pneumonia	Left bronchiectasis
35	1.5	Yes	Modern pneumonia	Left bronchiectasis
36	1.5	Yes	Modern pneumonia	Left bronchiectasis
37	1.5	Yes	Modern pneumonia	Left bronchiectasis
38	1.5	Yes	Modern pneumonia	Left bronchiectasis

Lymph node inflamed with plasma (necrosis)

and often recurrent attacks of pneumonia in the same lobe was frequently noted. In 46 per cent of our cases there was a history of one or more attacks of acute pulmonary infection and in many instances the first evidence of an endobronchial lesion was an acute febrile episode usually diagnosed as pneumonia.

Another important symptom caused by the bronchial obstruction is the so-called asthmatic wheeze which may vary from slight wheezing respiratorily to rather marked asthma or even severe stridor. Since these tumors fairly frequently have long periods the attacks of asthma may be precipitated by change of position and often especially in the morning. Wheezing was a prominent symptom in 3 per cent of our cases and was the initial symptom of which the patient complained in 4 per cent.

If the bronchial obstruction allowed to persist without treatment pulmonary suppuration ultimately develops in the distal portions of the affected lobe. This may take the form of bronchiectasis, pulmonary abscess, pulmonary gangrene or empyema. In 23 per cent of our cases there

as clinical evidence of pulmonary suppuration. These secondary processes sometimes become so marked that they fairly frequently obscure or even obliterate the primary lesion. In fact pulmonary suppuration rather than the tumor *per se* is the chief cause of death in most cases.

Since the signs elicited by physical examination are usually dependent on the degree of broncho stenosis and the amount of pulmonary suppuration they may vary considerably. Over the affected region there are usually decreased expansion of the thorax, impaired resonance and decrease of breath sounds.

ROENTGENOGRAPHIC EXAMINATION

Direct or indirect evidence of an endobronchial lesion may be obtained by roentgenographic examination of the thorax. The tumor mass can at times be clearly outlined by tomographic studies and at times can be outlined if a roentgenogram is made after the bronchi have been filled with iodized oil. A region of atelectasis is indirect evidence of bronchial obstruction and should cause one to suspect an endobronchial tumor. In 7 per cent of this series of cases an obstructing lesion of the bronchus was suspected on roentgenographic examination.

BRONCHOSCOPIC EXAMINATION

Although biopsy of a specimen obtained during bronchoscopic examination is essential in deter-

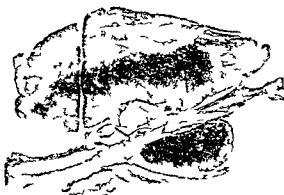


Fig. 1. To the histomorphological
thickened wall of the bronchus, the tumor
is seen as a dark mass. The surrounding
tissue is lighter. The tumor is composed
of large, polygonal cells with abundant
cytoplasm and prominent nuclei. The
tumor is surrounded by a thin layer of
connective tissue.

mining the exact nature of any endobronchial lesion these neoplasms generally present such a typical gross appearance that the bronchoscopist is frequently able to make a correct diagnosis from the gross appearance alone. There is partial or complete occlusion of the bronchus by a smooth, freely movable soft vascular mass which may appear pink, red or purple. The surface of the polypoid lesion is characteristically smooth and rarely ulcerated but slight contact may precipi-



The gross appearance of the tumor is that of a large, fleshy, lobulated mass. The surface is smooth and glistening. The tumor is surrounded by a thin layer of connective tissue. The tumor is composed of large, polygonal cells with abundant cytoplasm and prominent nuclei. The tumor is surrounded by a thin layer of connective tissue.



FIG. 3. Adenoma of the bronchus. Gross specimen. The tumor is a large, lobulated mass with a dark, pigmented surface, attached to a central stalk. The surrounding lung tissue is visible.

tate rather marked bleeding usually the entire intima or midline of the bronchial wall

PATHOLOGY

Although adenoma of the bronchus presents a almost characteristic gross appearance the final diagnosis must rest on positive microscopic evidence. In all of our 5 cases the diagnosis of adenoma of the bronchus was established by positive microscopic evidence. In all of the cases this was based on the use of endoscopic call. In 1 of the cases (Table II) the tumor was available for microscopic study while in 4 cases necropsy material was available.

Gross Features. The adenomas varied considerably in size the smallest being millimeters in diameter and the largest 8 centimeters in diameter. The length and width of the pedicle attaching the tumor to the bronchus varied greatly. Generally the site of attachment of the adenoma to the bronchial wall was narrower than the greatest width of the tumor. In 1 case this was very strikingly illustrated. Four times the greatest diameter of the tumor was 8 centimeters

but the pedicle at its attachment to the bronchial wall was only 3 millimeters in diameter.

There is a tendency for adenoma of the bronchus to infiltrate the bronchial wall and the peribronchial tissues. In 1 of the 5 cases in which the lung was available for study there was invasion of the bronchial wall and peribronchial tissues (Fig. 3). In the remaining 4 cases there was no infiltration of the neoplasm into the bronchial wall peripheral to the cavity of the main mass of tumor being within the bronchial lumen.

Adenomas invariably arise from the main stem or larger bronchi. The right lung was more frequently involved than the left. 3 of 6 cases the lesion was located in the hilum and in cases in the left lung (Table I).

The condition of the lung distal to the neoplasm depends on the degree of bronchial obstruction which the tumor has produced. Various degrees of bronchiectasis were encountered. Since the neoplasm was usually situated in a large bronchus bronchiectasis when present frequently involved a large portion of the bronchial stem either for one lobe or occasionally for the entire lung. Pneumonia invariably accompanied the bronchiectasis. In all but 1 of the 5 cases in which the lung was available for study there was some bronchiectasis. Example shown in Figure 3. In this case the adenoma had been fulgurated electrically and the bulk of the structure removed. The bronchiectasis and pneumonia remained however and were clinically responsible for death.

No metastatic growth was found outside the thorax in the cases of adenoma of the bronchus in which necropsy was performed. In 1 case only was a local hilar lymph node involved and this node was adjacent to the neoplasm.

Histologic Features. The cases are made difficult to connect with the accurate histologic diagnosis of this type of neoplasm from a small piece of adenoma of the lung is likely to be confused with other lesions histologically. It must be differentiated from high grade malignant small cell bronchogenic carcinoma. This is important because of the vital different prognosis of these two lesions. If we are on a cellular basis it is not often mesodermal in differentiation between these two lesions. Although the characteristic features of the small cell variety little with two types of neoplasm several differential features were found helpful. Most of these can be found in the tumor cells of the bronchogenic carcinoma type but are all absent in the adenoma type. Degeneration of the tumor cells (pleomorphism, karyorrhexis and necrosis) is much more common in bronchogenic carcinoma than in adenoma.



Fig. 4. Adenoma of the bronchus. f b h B i y p e m S m l l
Th po ly f d H t yl d
X7



Fig. 5. Adenoma of the bronchus. f b h B i y p e m S m l l
Th po ly f d H t yl d
X93

Another lesion that must be differentiated from adenoma of the bronchus is the hyperplastic type of epithelium which is seen about infarcts of the lung (Szyre). This should not cause difficulty because infarcts usually occur in the periphery of the lung where adenomas are not seen. Because of its peripheral location this lesion is encountered at necropsy but not bronchoscopically. A diagnosis of carcinoma in the region of an infarct of the lung should be treated with considerable skepticism.

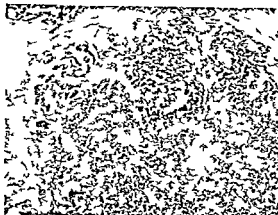
The type of cell which is consistently present in adenoma of the lung is a fairly small rounded cell which does not have marked hyperchromatism of the nucleus. There is little variation in the size of the cell. We have been impressed by the remarkable homogeneity of all 38 different adenomas. Mitotic figures are practically absent in the neoplastic cell populations.

The tumor cells consistently make an attempt to form acini but are rarely very successful in their attempt. The result is that the cells group themselves into alveolar groups of cells which have poorly formed lumen or else they group themselves into cords of cells (Figs 4 and 5). Womack and Caham have considered that similarity exists between the adenomas and medullary tumors of the salivary glands. The finding of cartilage and

bone in the substance of these tumors is not difficult to explain when one considers that invasion through the bronchial wall does occur and that the bronchial wall has cartilage in it which sometimes turns to osseous tissue.

Invasion of a lymph node is present in only 1 case. In this particular instance the involved lymph node was adjacent to the tumor and it seems probable that this process does not represent metastasis in the sense of a tumor embolism but rather represents a direct invasion of the lymph node (Fig. 6). In no instance in this series did metastasis occur to the other lung or outside the thoracic cavity. Ultimately this feature differentiates the adenoma type of lesions from bronchiogenic carcinoma.

Between the groups and cords of epithelial cells there usually was a thin stroma of connective tissue. In this stroma were found large numbers of thin-walled blood vessels lined by endothelial cells. A noticeable feature of all adenomas of the bronchus has been their vascularity. It is no wonder that bleeding is a prominent feature in the clinical course of these neoplasms. In fact many adenomas morphologically simulated neoplasms of blood vessels. The epithelium overlying the tumor was frequently intact although at times it was ulcerated. In no instance the tumor cells seemed



F 6 H&E lymphoid case f d m f bro
h p tally ded ppe l f l d r n f m ca
m Th ppe ed t be d ect in th th
mbol ph H t ty l d X6



Fg This ph t m oer ph prese t l f
th bro h Th ll f th t m ppe t be g
tu f m th b h l m gl d H t y l
nd X

to a se directly from the peribronchial mucous glands (Fig 7). It seems probable that the surface epithelium of the bronchus which is the usual source for the origin of bronchiole carcinoma is not always and indeed may never be the source from which the adenoma originates.

Adenoma of the lung in many ways is similar to types of neoplasm in other parts of the body. In many basal cell carcinomas (rodent ulcers), cylindromas, carcinoid tumors of the appendix and ileum, islet cell tumors of the pancreas and adenomas of the parathyroid. The similarity is based not only on the slowness of growth and tardiness to metastasize but also on morphologic grounds.

It is obvious from this study and others that adenoma of the lung is a neoplasm of the lung. It cannot be compared in so far as prognosis is concerned with bronchiole carcinoma. Although occasionally it resembles bronchiole carcinoma. Morphologically for the most part the cellular picture is utterly different. The slowness of growth and low metastasizing factor are features of bronchial adenoma which remove it from the realm of bronchiole carcinoma. However, because of the fact that it has the potentialities of invading the peribronchial tissue and lymph nodes (Fig 6) and because it can become a space-occupying lesion obstructing the bronchus and thereby producing bronchiectasis and infection of the lung bronchial adenoma a lesion that if left untreated will eventually kill the patient. For these reasons it seems better to think of bronchial adenoma as malignant thereby admit to their potentialities for killing the patient but

at the same time sharply differentiate them from the ordinary type of bronchiole carcinoma.

PROGNOSIS

In studying the prognosis of cases of bronchial adenoma it is interesting to divide the series into those in which treatment was surgical (pneumonectomy or lobectomy) and those in which treatment was more conservative (surgical diathermy, radium or roentgen rays). These data may be summarized from Table I. In 14 cases in which lobectomy or pneumonectomy was performed there was 1 death or a mortality rate of 7.2 per cent. In 22 cases in which treatment was by means of surgical diathermy, radium or roentgen rays there were 13 deaths or a mortality rate of 59 per cent. These 2 patients did not die directly as the result of the treatment but some months later of other causes. Two of the patients did not receive any further treatment of these we have not been able to trace and at the time of writing the other was still alive and a year after his registration at the clinic.

TREATMENT

The chief difference of opinion of observers as to the most satisfactory method of treating bronchial adenoma. Generally the decision rests between attempting endoscopic removal of the lesion and extirpation of the lesion by means of lobectomy or pneumonectomy. The method to be employed must necessarily depend on many factors such as the patient's age and general state of health, the location of the tumor. Especially its relationship to the bronchus, the degree of second

ary pulmonary suppuration and the degree of peribronchial infiltration of the adenoma. The fact that peribronchial infiltration is so prevalent in cases of adenoma of the bronchus would seem to favor lobectomy or pneumonectomy as the procedure of choice. On the other hand, lobectomy or pneumonectomy is an formidable procedure and one that as yet carries with it a definite element of risk. Furthermore, peribronchial extension of the adenoma of itself as experience has demonstrated is not always as serious a state as might be expected.

At the present time it is our practice to employ the conservative form of treatment in those cases in which the adenoma is attached to the bronchial wall by a comparatively narrow pedicle, is movable and is situated in a bronchus that can be adequately and thoroughly visualized bronchoscopically. The degree of peribronchial invasion is as a rule extremely difficult or impossible to evaluate from gross inspection. Bronchoscopic removal of the tumor is also indicated when the adenoma is situated so close to the corva that surgical treatment would be inadvisable and also when the general condition of the patient is such that lobectomy or pneumonectomy is unduly hazardous. The advantage of bronchoscopic removal lies in its comparative safety. It is imperative that patients thus treated be followed by at least yearly bronchoscopic checks to be certain that adenoma does not recur. There is no other method to detect early recurrence.

Lobectomy or pneumonectomy is the procedure of choice when the adenoma is situated in a bronchus that cannot be adequately visualized bronchoscopically. It is generally preferable in those cases in which there is marked evidence of associated pulmonary suppurative disease. It is also preferable when there is obvious evidence of peribronchial infiltration or when an adenoma of the bronchus has been treated endoscopically and tends to recur.

The dominant feature of surgical removal of the tumor lies primarily in the fact that after the lesion has once been removed this manner recurs rarely or extremely rarely. Hereas follows in the comparative removal of such lesions are compared the results. With the great strides that have been made in the field of thoracic surgery and the related surgical mortality associated with lobectomy or pneumonectomy for adenoma of the bronchus are employed in this method of treatment with increased frequency. The conservative form of treatment still has a definite field of usefulness. However, it still holds a very honorable place in the treatment of adenoma of the bronchus.

At times it may be of advantage to combine the two methods of treatment. In Case 23, Table I, the adenoma was situated in the left lower lobe bronchus and was associated with marked secondary pulmonary suppuration. Surgical treatment seemed indicated and was employed. On exploration the lung was found bound down by a mediastinal mass that would not permit pneumonectomy or lobectomy. Subsequently the tumor was destroyed by endoscopic means and the patient has remained well up to the present time with no evidence of recurrence.

The problem of treatment is further complicated by the fact that in certain instances favorable results may be obtained from roentgen therapy alone, as is well illustrated in Case 34, Table I, in which the patient is still alive and well 12 years after treatment, although the tumor itself is still present. Roentgen therapy as a rule does not seem to influence the size of the adenoma markedly, although at times it does seem to have a limiting effect on its development.

CONCLUSIONS

Adenoma of the bronchus is a relatively common tumor involving the tracheobronchial tree.

2 It occurs usually among younger persons than does carcinoma of the bronchus and in contrast to bronchogenic carcinoma is more common among women than among men.

3 It is generally slow growing and usually gives rise to clinical symptoms only after a much longer period than carcinoma of the bronchus before the diagnosis is established.

4 In our experience cough is the most frequent and earliest symptom of adenoma of the bronchus. Hemoptysis, asthmatic wheeze and recurrent bouts of pulmonary infection are other common symptoms.

5 Adenoma of the bronchus generally presents a characteristic bronchoscopic picture but the final diagnosis must rest on microscopic examination.

6 Adenoma of the bronchus presents a characteristic microscopic picture. Mitotic figures are usually absent. The type of cell is consistently a fairly small roundish cell which does not have marked hyperchromatism of the nucleus. The tumor cells consistently make an attempt to form acini but rarely very successful in the attempt. A noticeable feature of all adenomas of the bronchus has been the vascularity. In no instance in our series did metastasis occur to the other lung or outside the thoracic cavity. From our study we feel that adenoma of the bronchus should be regarded as a neoplasm of the lung. *SMITH*

The method of treatment to be employed in cases of adenoma of the bronchus depends on the situation of the tumor, the degree of secondary pulmonary suppuration and the patient's general condition. In our experience endoscopic destruction of the tumor and destruction by surgical extirpation of the tumor by means of lobectomy or pneumonectomy are the most satisfactory methods of treatment.

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AN EVALUATION OF THE COFFEY I METHOD FOR URTEROINTESTINAL ANASTOMOSIS

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THE many and varied procedures devised for transplant the ureters into the bowel suggest that no highly satisfactory method is yet available. The Coffey I operation in our hands has been reliable though not ideal. This technique probably is not the final solution of the whole problem nor is our application of it perfected. This relatively old procedure has been overshadowed by emphasis on newer methods. Thirty-nine consecutive cases are here reported to demonstrate early results and to offer some comparison with reports on other methods. No attempt is made to discuss the general treatment of bladder cancer etiology and other conditions for which urinary diversion may be advisable.

The conditions for which transplantation might be desirable are common. Hence the technique preferably should be one readily mastered by the well-trained surgeon. Some of the methods described in the literature seem to require unusual manipulative skill. If such highly specialized method yielded definitely superior results then it behooves surgeons and urologists in particular to acquire the needed special skill. Upon reviewing the literature we find no method which has produced results superior to those following the Coffey I method as demonstrated clinically by a consecutive series of reanastomoses. The Coffey I method is simple and direct. In general, highly specialized techniques are less enduring than simple direct procedures. These are of course not limitations. Most reliable operations are not only based upon established surgical principles but also apply these principles as directly as the situation permits.

When the Coffey I procedure is used all steps may be visualized so that the operator knows what to do. Manipulation of peritoneum and rectum intraperitoneally is dependent on the necrotic effect of a suture and the likelihood of essentially blind maneuvers. With the Coffey III (27) and Hirsch (6) procedures the cut through of the peritoneal necrotic tissue

must occur or complete failure results. This fact is recognized by some proponents of such method who have advised placing gauze or a tube in the lower bowel and including this gauze or tube in the necrotizing sutures. Then if the cut through is not forthcoming tract on on the packing or tube is added—an essentially blind maneuver. With Jewett's method (11, 12) the formation of the actual stoma is accomplished solely by touch and is tested by passing a sound through the ileocecal bowel and ureteral walls. Tangential cuts have been made with Jewett's instrument with disastrous results from leakage. To avoid some of these difficulties Jewett has devised a set of bulb sounds. He also advised inflation of the rectum with air and more extensive mobilization of the bowel. In passing one not uncommon fault of the highly specialized methods is that the procedure may become more and more complex with each perfection.

Manipulation and contamination can be reduced to a minimum particularly when both ureters are transplanted at one operation. Of the last 10 cases in our series only 1 was done in two stages. The Hirsch and Jewett operations require two stages to complete any one anastomosis (though the first stage of both sides is usually done at the first operation while at the second the anastomosis is completed bilaterally and often the surgical procedures are carried out). Adhesions encountered at the second stage have been a major problem but careful attention to avoid peritoneal injury has greatly reduced this hazard (12). With the Coffey I method however any one anastomosis is completed at one stage and does not have to be dissected and handled again. Manipulation tends to decrease blood supply and increase the possibility of soiling. As will be noted later deficient blood supply underlies many failures. Abscess formation is not due to the inevitable slight soiling (which the peritoneum readily overcomes) but rather to sloughs massive soiling and the leaving of an open fistula communication with the peritoneal cavity.

No foreign bodies remain in the lumen of the urinary tract. Catheters increase the hazard of

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Fig. 1. Autopsy specimen of a patient who died 44 years after the operation. The specimen shows the bladder and the ureter, which were anastomosed. The patient had a long history of urinary tract infection and had been treated with various antibiotics. The specimen is shown in the figure, with the bladder and ureter clearly visible.

infection. They may become pleased that they have attained their aim of producing good drainage. Furthermore, they may compensate the blood supply of the ureter and lead to sloughing with subsequent leakage. The Coffey III method (2) is the classic example of ureterosigmoidostomy with the use of catheters. McCamb (14) and G. G. Smith (15) strongly favored the results of the Coffey I over the II method after trying both operations. The experimental use of vertical ureters in the anastomosis to insure patency was not successful largely due to calculus formation. (1) Any permanent foreign body in the urinary tract greatly increases the hazard of stone formation and intractable active infection. However, even with adequate urinary output per rectum should be obtained. Other factors permit a plan which accomplishes the best ultimate result, the least risk, and the minimum number of operations; the procedure of choice. In this series of the ureters were transplanted in one operation, 3 times in all of these cases within a week, and the majorities had urine in the rectum at the end of the procedure. Those who had spinal anesthesia had less delay than those who had general anesthesia. In the nine series of 9 cases all upper tracts which functioned preoperatively continued to function in the immediate postoperative period.

Two upper tracts which had no function before transplantation regained good function after the operation. Theoretically, the Coffey III method and some of the two-stage methods might produce renal damage before the transplants functioned adequately. Practically, however, they appear to be absent or insignificant.

The wide area of contact afforded the ureter and bowel by the large wide submucosal trough provides adequate adherence to prevent leakage, allows for some collateral circulation between the two organs to lessen the possibility of anastomosis, and promotes adhesions which should take them on away from the site of critical union. This is true of all methods utilizing Coffey's main principles. Coffey's operation is Hynes, Jewett's, Hinman's, Foley's, and others. It is not true of the Maydl and Bergenhem (4, 13) operations and while some beautiful results have been obtained by these operations, they have been generally unreliable and are no longer used. Altogether, Maydl and Bergenhem operations are unviable in a program for bladder cancer since a portion of bladder remains attached to the ureter.

The valve action for which Coffey devised the submucosal trough is an additional advantage, but the presence or absence of the valve action cannot always be correlated with the clinical results. If a patient lives 44 years and 8 months after operation works regularly and raises a family, his transplant is certainly a clinical success. Autopsy was obtained on such a patient but no valve action could be demonstrated (Fig. 1). The perat Fowler (20) attempted to obtain valve action by attaching the ureteral end to the upper surface of a tongue of bowel mucosa which would be pulled upward by bowel content and thus occlude the ureters. This method did however provide a wide area of contact. From the autopsy specimen one could not expect that the valve mechanism had only recently given way. Altogether, the patient is not involved until shortly before death.

With the Coffey I operation no special constructed instruments are necessary; the usual laparotomy select is being sufficient. The instruments devised by Hinman (8) and Foley (3) apparently did not become popular. Jewett's special electrotonic (1) the best known device is current use. As defined in special skill or knowledge needed for proper use, the instrument itself must be obtainable, kept in good condition, and the final expense, while minor importance cannot be overlooked, special instrument.



Fig 1. Left: pyloric mass before anastomosis. Right: pyloric mass after anastomosis. H = 37 347

sometimes show a tendency to multiply themselves for example into sets of varying caliber and varying curvatures. Again a method using special instruments should show clearly superior results to the simple direct Coffey I to warrant the expense extra training and trouble in obtaining and using that tool.

Ureter ligation should be avoided as it may interfere with blood supply as well as urinary drainage. Any portion of the bowel from the descending colon to the rectum can be used. The bowel may be mobilized if necessary. There is however less latitude on the right side than on the left and hence a greater length of ureter is necessary on the right to permit a nonanastomosed course. The right side was always transplanted first in this series.

Absence of ureteral tension is a sine qua non to success and is readily accomplished by the Coffey I method. Tension decreases ureteral blood supply and tends to make the anastomosis sutures cut through. The operator should be reminded that traction on the ureter during dissection temporarily lessens it. Some excess length must also be allowed for mobility of the bowel and ureteral motion. Lack of refluxancy between the ileostomy and the ureter is one of the common causes of failure.

Right hemicolectomy of the peritoneum is attained by tacking a flap of parietal peritoneum over the anastomosis. Peritoneal contamination is

but gross displacements of the bowel which could pull or angulate the ureter are prevented. In



Fig 3. Left: dog before anastomosis. Right: dog after anastomosis. H = 37 34

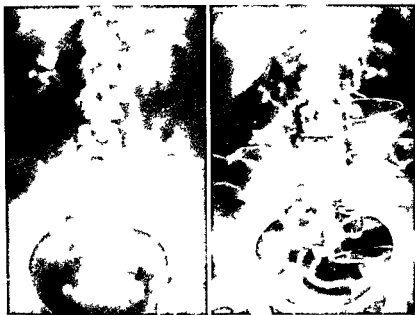


Fig 5 P p t l ft d p t p e t ght t py l g m h
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In both these cases leakage occurred after at least 1 week. This fact suggests that the ureter had sloughed. The operative and autopsy findings indicate the same. Probably the commonest cause of leakage is failure of blood supply to the ureter leading to slough. Of course actually leaving an open communication with the peritoneum at operation will allow leakage but any method which does this with regularity will be abandoned abruptly. Also if such does occur the signs of leakage should on the average appear much earlier than in our instances. If the ureter is said to have sloughed on the failure of blood supply seems obvious but if the ureter is said to have pulled out the idea cannot be that traction *per se* was the cause. Sutures cut through by ischemic necrosis. Tension duces ureter l blood supply and also pulls on the anchoring suture (in effect tightening it). Yet if there is no failure of blood supply we believe sutures will not cut through and healing should proceed. Moreover breaking or untying of a chordal suture must be rare. This sloughing out and pulling out of the ureter are both due to ischemia in the final analysis. Unless infection is very rampant and this necrotic gives reason of the local failure of blood supply is the ultimate cause of sloughing from infection. Although noted before leakage is not due to the contamination occur



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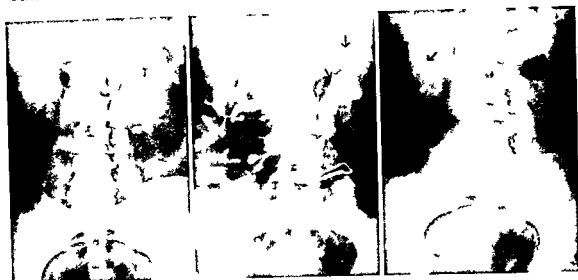
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In the reported series the nonfatal p stoper at ve complications are often not mentioned and only seldom described. A perusal of case histories when included however indicates that nonfatal complications are by no means rare—in fact, in some cases they are more the rule than the exception. Our total complication rate including both fatal and nonfatal was 23.0 per cent. The nonfatal complications numbered 5 or a rate of 1.8 per cent. We define postoperative complication as any untoward occurrence between operation and the time of discharge which has added a hazard to or prolonged an expected smooth convalescence. In other words 77 per cent of the patients in this series had a satisfactory recovery in the hospital. The nonfatal postoperative complications are outlined in the following. There were no fecal fistulas at any time. At a second admission of the ureter as male terminal temporarily to the external operation (case J B N Y H N 358 636 described later) I expect this instance the case was no urinary drainage from any wound. No patient had a permanent urinary diversion except the transplant to

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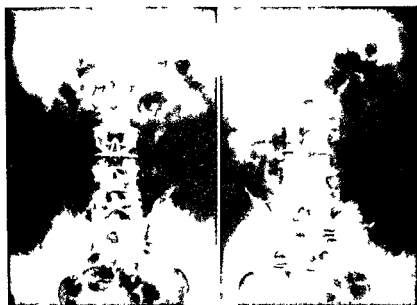
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We consider the our worst result from a pyelo-
graphic aspect (Fig. 9). The patient has re-
maind symptom free here and is clinically
well. The blood urea nitro is checked at in-
terval in the Out Patient Department has varied
from 5 to 61 milligrams per cent the most recent
was 3. A calculus has formed in the right kid-
ney this been the only incidence of stone forma-
tion except for 1 patient whose renal calculi were
removed before transplantation and who has
had a recurrence since the retrocystostomal
anastomosis.

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What results were obtained regarding the
urinary tract proper. Apparently transplanta-
tion of one ureter and ligation of the other is not
a rare urological practice. It is our opinion that
these patients sooner or later will all the func-
tion of renal tissue it is possible to conserve.
Ligation of one ureter condemns that side to
nonfunction and necessarily defeats one of the
most important aims of urology, namely preser-
vation of the best possible renal function. If the
side to be ligated is nonfunctional and repair
abundantly demonstrates the same, justification
We can imagine unusual circumstances where
transplantation of one of the ureters might be
impossible but in such a case the patient's
interests which include palliative cases. Valuable
function has turned after operation sufficiently
often in our series to make us allay any
transplant both ureters. The double seems
slightly compared to the possibilities. If one side
ligated and the transplant failed, the other ob-
viously follows—a risk not slight. Also, it is not
inconceivable for the late development of trouble
for example pyelonephrosis.

These 39 patients had 9 ureters (the right 16
being double) and these functioned well.



intra venous pyelogram before operation and 77 days after operation. The 4 patients dying post-operatively had 8 functioning upper tracts even though 2 of these transplants leaked as discussed previously. After the original discharge the kidneys became nonfunctional as judged by intravenous pyelogram and a nephrectomy was performed on another. The history indicates that one other patient died of renal failure 9 months after discharge. These last 3 cases and several that showed a definite improvement in function are outlined in the following.



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M B \ \ H \ 337 34 mal f rm ed 6
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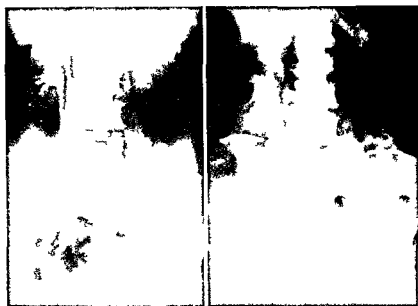
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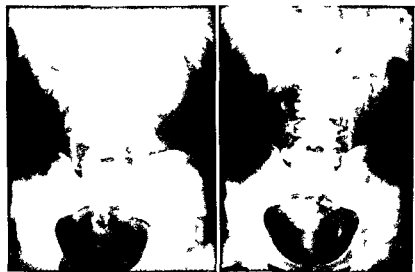
t eneral epis and reabsorpti n than actual
failure of the renal parenchyma (Case M H No
391 pre you l described) The other pat e t
em in clin call well and she l pleased with the
result thou h we are n t (Case \ \ H No
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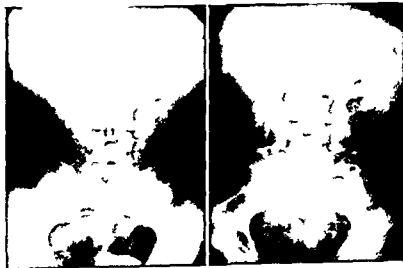
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 \ 3 4

The procedure in all cases is the Clevé operation with particular attention to the following:

A complete diagnosis and general evaluation was always made. Intravenous pyelography usually sufficed but repeated or retrograde studies were made when necessary to a clear diagnosis in the status of the upper tracts. A barium enema while perhaps not essential always has been of value. It allows the operator to plan his method of procedure. In at least 1 instance ureteral transplantation was contraindicated because of extreme diverticulitis plus signs of bowel infection. If bowel symptoms should appear after ureteroenterotomy the known preoperative condition of the organ would be most advantageous. The functioning capacity of the anal sphincter should be determined. Usually the history and digital examination are sufficient but in doubtful test by enemas in order.

Bilateral simultaneous transplantation is done whenever feasible. Twenty-three (59 per cent) of the 39 cases were done with 2 deaths, a mortality of 8.7 per cent compared to 12.4 per cent mortality in the 16 done in separate operations. This difference is not significant because a chance of only 1 mortality from the second time the first operation would make these items 30 and 162 per cent respectively. No complications were attributed to the single stage plan.

Preoperative preparation of the bowel is most important. The usual regimen was 5 to 6 days on 8 to 10 grams sulfasuxidine daily, enema every



F. 6. Preopera. l. f. d. post opera. h. t. p. l. o. r. a. m. l. l. r. a.
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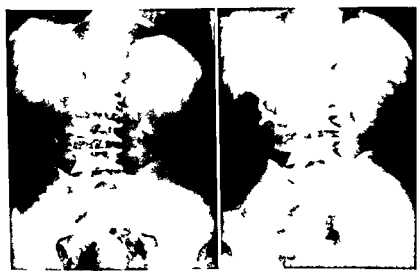


Fig 8 P p t l ft d po t pe t ght pyel gram h g good
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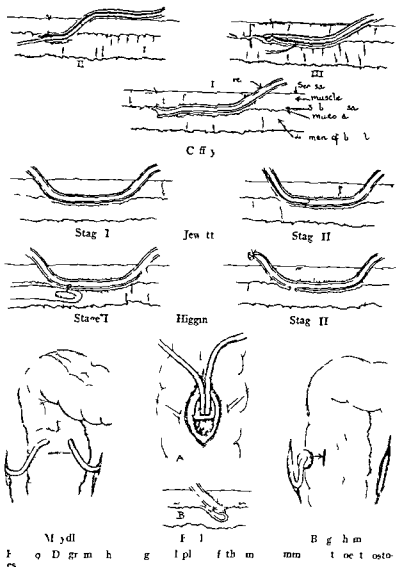
other lav cath rtic (usually citrate f magnesia 20 cc) on alternate lavs and l r s lue d t The d et was reduced to clea fl id the day bef e operati n nd both an enema nd the catha tic were given Also sulfa l a i e 5 gr m 4 times a lay w s starte l the lav bef re

Anemia avitaminosis etc a e app opriatel trete l bef e peration

Choice of anesthesia has varied but in general continuous spinal has been quite satisfactory

An infusion is gi en during operati n and ally tran fusion

At operati n the foll v ng are emph ed good exposure gentle h ndl ng obtai ng an adequa te len th f ureter protect ng ureteral blood supply arrang ng the anast mosi to be



the tension on suture in which is merely apposition and partially immobilizing the site of transplant. The ureter becomes temporarily lengthened during dissection and the bowel is often displaced from its natural local factors to be borne constantly in mind. We insert the first suture line and the site of the anchoring suture with a second line of interrupted fine silk suture. Special care must be taken that the upper end of the anastomosis is not closed tightly about the ureter by making the suture lines too long.

We have not hesitated to transplant dilated ureters. None of the ureters in this series were

more than one centimeter in diameter. Several were one centimeter in diameter. We have the impression that results with moderately dilated ureters are somewhat better. Probably the retroperitoneal blood supply is large and the size allows for shrinkage and fibrosis, yet ultimately a good caliber.

After operation a large rectal tube is kept in place constantly for five or six days. The tube is changed twice daily and most often if not draining. Channing is not insured. Also because a high position of the tube improves drainage. This decompression relieves pressure

TABLE I—ANALYSIS OF 39 PATIENTS WITH COFFEY I TRANSPLANTS

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De th	4	
D t f l f r t ((M H N		
69 d NYH N 37 34)		
D t th se (Ca M H N 7 80	5	
d NYH N 3 86)		
C m p l c a t u	5	
F t a l d f t l	9	3
N a f t l	5	8
P l m r y b l (C N Y H N		
396 3)		
W d p t (C se NYH N		
35 927)		
Obstru t q g t m p r y		
ph t m y (C N Y H N 33 76)		
F b l t l h d ph		
(Ca N Y H N 36 39)		
W d f t (C se NYH N 373		
934)		

P t t s d s c h g d	35	
I y l p h t f t d s c h g (l l d)	3	
C a l f f r m t u d s c h g (h d		
l l u m e d b e f t p l t t)		
De th d s c h a g		
Ca C m	9	
R l f l (Ca N Y H N		
373 934)		
I h l b t (C se NYH N 394		
88)		
P t t t l l l g	4	6 6
I l l d 3 t 47 m th		

Blood nut b 3 gm cv t	7	
Blood t g perm tly bo 3		
gm 9 (N Y H N 37 347 d 360 39)		

on the suture line promotes output and decreases possible mild rectal reabsorption. Enemas and irrigations are contraindicated since they increase intracolonic pressure. Relatively mild cathartics indicated about the 10th day. A low residue diet is continued for weeks. Sulfadiazine 0.5 grams 4 times a day is given for about 2 weeks to lend a bacteriostatic quality to the urine. Usually a Wneksteen gastric drainage is started immediately after operation and used intermittently for 2 or 3 days. This procedure prevents distention which we found troublesome in many cases before its use. Finally an intravenous pyelogram is made to check the result.

TABLE II—ANALYSIS OF 79 COFFEY I TRANSPLANTS

	P	ts P
U t t p l t d		9
N m b e f t n u g k u d y s b y t		
p y l g m m m d t l y p e o p e t l y	75	
N m b e f t n u g k u d y s b y t		
N m b f t n u g k u d y s b y t	77	
p y l g m t t u f d s c h a g (4 p t t		
th 8 f t g k u d y s d i d)	69	
N m b e f t p l t f l g f t d h a g	4	
U m d t h (p t t b t t p l t)		
N f t c a n k		
S m l t a n t l t l t p l a t		
(p t t s)	44	
U t t p l a t d t l t p e t		
(6 p t t)	3	
T h t t p l a t d m l t e o l		
(p t t)	3	
Res l t b f t p y l g r m (f g s 4 8)		
Good	37	46 9
I t m d t	3	4 6
P o o		

SUMMARY

The Coffey I operation for ureterosigmoidostomy has the following good characteristics: it is relatively simple and follows fundamental principles directly; no extraordinary surgical skill is needed; no special instruments are required; no foreign bodies remain in the urinary tract; immediate urinary output can be expected; clear visualization of all steps may be obtained; the ureter and bowel adhere well; tension and angulation are a suitable relative immobilization is possible; any residue is completed at one stage; and the early results are fairly satisfactory compared favorably with results obtained by other methods.

Our results with 39 consecutive patients are indicated (Tables I and II). The operative mortality from all causes was 10.2 per cent; the mortality due to local failure of the operation however was 5.1 per cent. The nonfatal hospital complication rate was 12.8 per cent. Seventy-seven per cent of the patients had a satisfactory postoperative course in the hospital. Preoperatively by intravenous pyelography there were 75 functioning upper tracts; postoperatively in the hospital 77 functioned. At this writing 3 to 4 months after operation 4 patients (61 per cent) are still alive and have 44 functioning upper urinary tracts.

A total hospital complication rate of 3 per cent fatal and nonfatal is too high especially in view of the fact that the procedure is so often a preliminary to further drastic therapy. However the desperate plight of most of the candidates

provides considerable justification. The symptomatic relief is often sufficient indication.

We have attempted to limit discussion to ureterosigmoidostomy itself and purposely avoided discussions of treatment of bladder cancer, ectrophys, fistula, etc. If ureteral transplantation to the bowel were a benign highly successful procedure it no doubt would be very widely used.

These operations were performed in the years 1941 to 1944 inclusive by the operator using essentially the same technique, the Coffey operation. Only one of the operators had had previous experience with ureteroenterostomy. The surgeons were at the New York Hospital, Stebens, A. McLellan, Dreyer, Whitmore, Gardner, and Marshall, at the Memorial Hospital, Twombly, and Marshall. None of these case records except the one by Coffey's method (c) has been previously reported.

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5 F. L. B. S. g. r. 93 8 2
6 H. C. J. L. B. L. 93 3 0 0
H. F. J. L. B. L. 93 3 0 0
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8 Idem S. Gyn. Obst. 93 64 9 0
9 H. M. F. d. W. S. M. J. T. 93 6
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4 McC. R. J. L. B. L. 94 4 4
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6 F. J. T. d. S. M. G. W. J. L. B. L.
S. M. C. C. J. L. B. L. 93 33 0 0
8 Idem T. Am. Ass. G. t. geo. 93 3
9 S. E. T. A. R. S. g. Gyn. Obst. 96 23 9
2 Idem J. U. 1 B. L. 94 46 5 66
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943 5 4 9

SURGERY OF THE MANDIBLE THE AMELOBLASTOMA

LOUIS T BYARS M D I A C S a d BERNARD G SARANT M D St Louis Misso

THE amel blastoma develops from the cell of the enamel organ during a particular phase of tooth development. It is found most frequently in the mandible less in the maxilla and occasionally in the pituitary gland tibia ulna and ovary. For the purposes of this report only the ameloblastoma of the mandible will be considered. Although this tumor is considered to be uncommon there have been over 400 reported (1, 4, 5, 6). Both sexes are affected in about equal frequency. The ameloblastoma has been recognized at birth and as late as the twenty sixth year the average age in Robinson's series was 37.6 years (6).

The ameloblastoma is generally described as a benign neoplasm although in a study of 39 tumors 45 percent showed metastases or histologic evidence of malignancy (6). A better known characteristic of this tumor is its persistence and tendency to recur after operative treatment. The tendency for the ameloblastoma to recur locally is probably due to inadequate surgical treatment. The purpose of this report is to consider (1) the surgical treatment of ameloblastoma of the mandible and (2) the reconstructive necessities subsequently.

BRIEF SUMMARY OF DENTAL HISTOGENESIS

A brief review of dental histogenesis will facilitate understanding the origin not only of the ameloblastoma but also of other dental anomalies. (Table I) Tooth development may be divided into three stages: (1) growth (2) calcification and (3) eruption. For the purpose of this report only the first stage (growth) will be considered. This stage can be further subdivided into (a) initiation (b) proliferation (c) differentiation and (d) apposition (Fig. 1).

Initiation. Between the sixth and seventh weeks of intrauterine life and proliferation of the oral epithelium begins (Fig. 1a). The dental anlage develops. Differentiation does not occur there will be no tooth development and anodontia will be the clinical condition (2).

Proliferation. Cellular proliferation continues utilizing growth and takes place in the connective tissue which borders the invagination of the epithelium and clefts. It forms the dentin

papilla. **Dentin.** The primordium of the dentin and pulp (Fig. 1b). During this period the early form of the odontome arises.

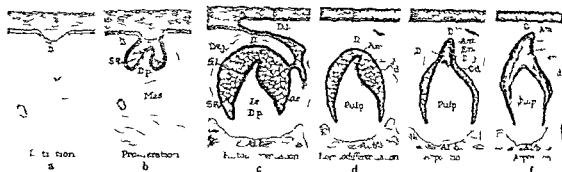
Differentiation. The enamel organ. The invagination gives rise to the outer enamel epithelium. The stellate reticulum. **SR** the stratum intermedium. **SI** and the inner enamel epithelium. **IE** (Fig. 1c). It is during this period that the ameloblastoma arises from the enamel organ. This occurs within the first few years of life although no activity may become manifest until some years later. Enamel is never found in this tumor. If tooth development continues normally however the inner enamel epithelium will differentiate into ameloblasts the enamel forming cells. Thus one can readily see that ameloblastoma is not the correct term because the tumor arises from the enamel organ before the ameloblasts have differentiated. The term preameloblastoma is more accurate.

In addition the odontoblasts differentiate from the adjacent connective tissue of the dental papilla. The dentinoenamel junction which forms the basic pattern of the tooth is determined between the inner enamel epithelium and the adjacent connective tissue of the dental papilla (Fig. 1d). It is during this period that the Hutchinsonian incisr and mulberry molar develop (9).

Apposition of dentin and enamel. In this stage a cusp of dentin is formed and with this stimulus the preameloblasts change to functioning ameloblasts and a corresponding amount of enamel is formed on the opposite side of the dentinoenamel junction (Fig. 1e). When this formation has been initiated there is a synchronous recession of the odontoblasts and ameloblasts from each other. Incremental layers of enamel are apposed one on top of the other until the cusp is fully formed. Subsequent layers are apposed at the sides until the crown is complete (Fig. 1f). Systemic disease during this period sometimes affects enamel formation (7, 8). After formation of enamel has ceased formation of dentin continues to complete the root.

DISCUSSION

Clinical findings. The ameloblastoma which is most frequently seen in young adults is characterized by a slow progressive swelling of the jaw usually near the angle. The tumor sometimes at



F D granu u p se tat of th bry l ry
f th l hum decid q O p l l unso (od n d
f m S mat d Sh g) O p l p th l m D
d ual lag D p d tal p pl E g n m l g
te nam l p th l m S R l l t t cul

S f t t m t m d l e r m t p th b m
D d cid P pe m t tooth t d M
nese hym O j d t o m l t u D j d l
l mma H b l col bo l m l blast O d O d
t blast E m l D d u

tains large proportions (Figs. 3, 4) extends toward the clavicle and weighs several pounds. The growth may be accompanied by pain. There is usually a history of a tooth or teeth having been extracted from the area several years previously and of several attempts surgically to eliminate the tumor. Fistulous tracts leading to the oral cavity and secondary infection of the tumor are not uncommon.

The buccal plate of bone is usually expanded most although the lingual bone may be expanded to push the tongue to the opposite side of the mouth. The bone is sometimes so thinned that it will crack like an eggshell. These are late findings after the tumor has changed from the solid to the cystic phase. The patient may be seen only after pathologic fracture has occurred. Only occasionally do true symptoms of malignancy appear.

Roentgen graphic finding. The roentgenogram serves as a valuable adjunct in the diagnosis of cystic lesions of the jaw but the final diagnosis depends on the roentgen and pathologic microscopic examination. The roentgenogram is most valuable for the early diagnosis of ameloblastomas of the jaw when the tumor is still centrally located, has not expanded the bone and is in the solid phase. It is at this time when most of the mandible is yet not destroyed that the tumor can be removed completely with no further deformity resulting to the patient. When the ameloblastoma has become cystic and considerable further clinical findings are obvious and the roentgenogram of primary value in showing the extent of bone destruction (Figs. 2, 3, 4). The constant characteristic roentgenographic description of the ameloblastoma (Fig. 5) is the multilocular appearance and the scalloped border. The bone means pathognomonic. The ameloblastoma

giant cell tumor carcinoma and therefore is which are destructive cannot be positively differentiated from each other on the roentgenogram (3).

Gross findings. The findings on gross examination vary with the stage of development of the ameloblastoma. Analysis of 219 cases revealed that 57.5 percent were cystic, 24 percent were both cystic and solid and 19 percent were solid (6). This classification is arbitrary and combinations of the solid and cystic tumors are found in varying degrees. The solid tumor which usually represents an earlier stage in development is of fine granular consistency and encapsulated. The cyst may be one principal mass, the numerous smaller daughter areas. The cystic type usually represents the solid tumor after cystic degeneration (Fig. 4c). The contained fluid may be clear yellow to red and either of a mucous or serous consistency. The bone is expanded and may be parchment thin (Fig. 4b).

Microscopic findings. Interpretation of the microscopic findings in the ameloblastoma is facilitated by an understanding of the histology of the enamel organ (Fig. 1). Thomas states there are many variations due to the stage of differentiation of the epithelium may attain when the tumor formation is an behavior of the stratum and the malignant character which may develop (Table II). Malignant degeneration although uncommon does occur (Fig. 6).

Simmons states that while the cuboidal cell predominates the growth is more malignant than in the cystic type with the elongated meloblastic like cell. Schwartz and Barnfield believe that there is no apparent correlation between the histologic pattern of the meloblastoma and its ability to metastasize.



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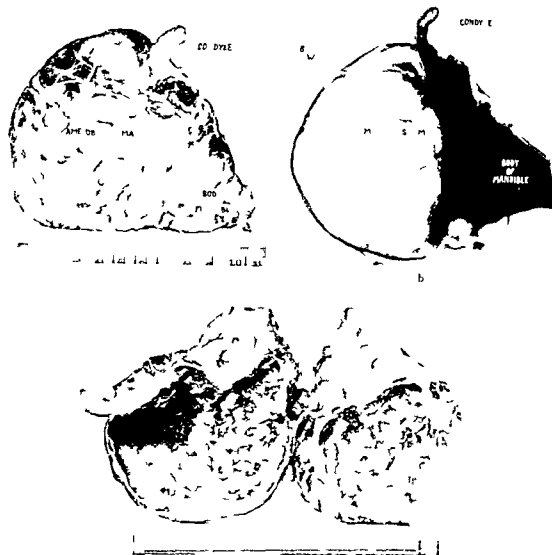


FIG. 4. Photograph of the specimen before and after resection. The tumor is shown in the center of the mandible.

FIG. 5. Photograph of the specimen after resection. The tumor is shown in the center of the mandible.

SURGICAL TREATMENT

Inasmuch as radiation does not affect the am loblastoma mater, the treatment of this tumor of the jaw is primarily surgical. But the surgical approach and the procedure which is carried out depend not only upon the diagnosis of the type of tumor but also upon its extent. In some instances the extent of the tumor will be such as to determine the type of surgical pro-

cedure. In other cases it is still necessary to know the type of tumor with which one is dealing and to determine subsequently the surgical approach and procedure on the basis of the histological examination. A direct roentgenographic studies will sometimes be required to make the diagnosis. However, a large proportion of mandibular tumors diagnosed histologically will not be certain. It is therefore recommended that both preoperative and postoperative examinations be made. (3)



b



d

Fig 5 Lat 1 oe tg g m f th m d bl h
b g d fi t h t n t f th l bl t

With gh f these l h p l t be
l bl t sc p t (J C tes)
C A M by C)

In the latter group either preliminary x-ray examination of a frozen section at the time of operation is of advantage. An accurate microscopic diagnosis will guide the operator's courage to do a radical operation if necessary, rather than diminish confidence in the less radical procedure. However, it has not been our practice routinely to do a resection of the jaw in dealing with the ameloblastoma. The more accessible lesions are first removed locally. The patient is warned that repeated postoperative examinations will be necessary over a long period of time to discover possible extension of the tumor. In many instances the local excision is adequate and not definitive. In other instances (1) where the large portion of the mandible is involved (2) where the tumor has definitely invaded beyond the confines of the bone or (3) where inaccessible areas of the mandible are

involved so that local excision could not be adequate resection of the mandible, the primary treatment of choice (Figs 2 and 3). Sometimes the choice of whether to do a local excision or radical resection must be made only after surgical exposure of the area of involvement. Especially is this true where the surgical approach is from the outside through the neck. In almost every instance where the surgical approach is from the inside of the mouth local removal is done.

Initial approach. Having made the decision to do a conservative local removal rather than a resection of the mandible, adequate exposure must be gained by freeing overlying soft tissues and attached mucoperiosteum over the complete extent of the tumor. Following this, overlying bone should be removed adequately so as to give a complete exposure of the underlying tumor and

TABLE I—STAGES OF TOOTH DEVELOPMENT DURING WHICH CERTAIN DENTAL ANOMALIES FIRST APPEAR

Stages	tooth development	Dental anomalies
I G	th	Adnat
b	I t t t	Od t
	D f f t t	P m l l l t m
	H t o d f f t t	(A l b l t m)
	M p h d f f t t	H t h
	d Appo t	Ch l g l i l i
II C l heat		(I m l hyp pl i)
III E pt		I d o d t

TABLE II—HISTOLOGIC CLASSIFICATION OF THE AMELOBLASTOMA (12)

Type	f	Ch f ha t n t
m l l t		
Ep th l m	L t l d f f t t	f p h t
	h h g c d t d	
St l t	F p th l l l l t t	h p e g
	h th t d f l l	
3 Am l b l t	Cyl i l l (p m l b l t) l g	
	f l l l	
4 Aca th m	St l l t t c u l m d f f t t t	
	s q m p k l l l p h l a l	
	p e l f r m t	
5 Ca c i m	S q m l l	

extent to which penetration goes and destruction is brought about with the thermal agent is better regulated than with the chemical. If the amelo blastoma has not been removed completely it has been our practice to use the electro surgical unit or Boye knife with the coagulating current and to go over the exposed bone surface. Heavier cauterization is done in areas of greater contamination with tumor tissue. The disadvantage of this procedure is that a certain amount of bone will be devitalized and sequestration will occur. In the meantime the presence of the devitalized bone will delay healing. However if the tumor and its immediate bony confines have been completely removed and destroyed cure is almost sure to result.

External approach. The external approach for both resection of the mandible and for local excision of the growth is the same. The incision should parallel the natural fold in the skin of the neck. It should be made underneath the mandible and should be adequate in extent to give complete exposure. The course of the facial vein branch of the facial nerve in the neck should be remembered. The nerve can be preserved if the approach is carefully planned. The incision should be marked on the skin with the head in a normal position and should be 2 centimeters below the angle of the mandible. A flap containing skin and subcutaneous

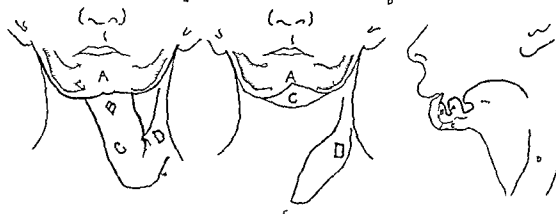
TABLE III—VARIOUS APPLIANCES USED TO CONTROL FRAGMENTS OF MANDIBLE AFTER RESECTION

I	
Appl	h h t l teeth (t l) p t
	f m t t s t th
I t d t l	es
b A h b	
Sw g d m tal pl t (th	th t j k s c)
d Spl t t th th d p e d	t p t i t g b
II	
Appl	h h t l b l t th (t l)
	l h t d t l p t f g t p d
W t t oc l	d m d l g p d
n m l	t k p p o t f g t d
b A h b	pl t th p o t f k t k p p o t
f m t d	
A h b	pl t m d b l e th p t p t
	t l y f i t t d t j t f b o d y l t
bo d	f r a m (H j) l t th th t j k
sc)	
d A ()	p t h t j t j p l t l l
	th t d t a l r i
A h b	pl t th p o t p t t t h l
	D t l y t b o
	T b o s c w
f W	p a s s e d t h g h d l l h l g l f d b l
d	t t a h e d p o t r i l y t h d p d e s t f
j w	o c l

III

Appl	es h h t l b o (t l d t l)
N m b e	f t th d u z f p o t f g m t
	t c e s s a l y d t
f B	s c w (d b) s e t d th h f g t
(Stad B r r y G f i t)	
	I t r a l
	E t r a l (p f e d)
b K l s c h	(m o d f i d) p d th g h f g m t
B	p a s e d th g h d l l h l d f h f g t
d O p	b t p l t t h d th c u f t l
	A l s o l f m d b e c f f l o c l e s m l f d b o
f n	d l f b o m f b e c f f l o c l e s m l f d b o
w a	d b o e l f b l i p l

ous tissue and platysma is then elevated. This includes the lower pole of the parotid gland and soft tissues anterior to it. Unless the lower pole of the parotid is elevated with this tissue the facial nerve must inevitably be severed. The entire ramus as well as the angle and most of the body may be thus exposed. Having exposed the area of the tumor removal may be done in one of three ways. The procedure of local removal by shell no. 1 of the tumor and applying the cauterizing agent may be followed in certain cases. In other instances it is possible to do a partial block resection of the mandible. The Albee saw is used to remove the tumor and containing block of bone but a broad rib bone is left to maintain the continuity of the mandible. This is rarely feasible. The third method is to resect the mandible (Figs. 2 and 3).



F 8 P operat (tak N mbe 2 944)
d b post pe atis (tak n F bru 94) ph to-
graph f pati t h had b i t th tenor portion f h
d bl f m b cu pid t b p d ea Th had lso
bee los f soft tiss Th se binds th t

m d bul fram ts as lased A k best p
se ed t gr dded sol t Th sam fl w sed
t line the bucal lcu d l bo d f h A
bo graft has been insert d bee tly D ram m
p ese tati f so c an l se f flap t b

The site of resection of the mandible is usually been determined before and has been studied in the roentgenogram. It possible some portion of periosteum is left intact to bind the cap. All bleeding is controlled. Where possible, muosa is sutured so as to screen off the mouth from the neck portion of the wound thus prevent contamination. The neck wound is closed curatel with drain inserted.

Method of fixation—Wherever resection is done, the patient must be made to maintain the firm fixation of the mandible in a near proper position. A possible prior to bone graft repair (Table III). If there has been dis-

articulation in removal of the arm, then only the anterior fragment must be considered and in this case the simplest and best method of maintaining position is with the remaining teeth occlusion until complete soft tissue healing has taken place. This same procedure may be the simplest all when there are teeth on both the anterior and posterior fragment. However, if the resection has been at the angle of the jaw so that the anterior and ramus remain as the posterior segment, some means must be taken to maintain contact between the fragments but at the posterior fragment is not possible. (Fig. 1) Various methods have been used to control the



T 9 P p t (t k No mt 94)
d b d po t p t (t k D mb 943)
ph t or ph f p t t h h d l t th t l ft d
f th m d bl Th b y d t l g p t f
b t l d Th b y p t t t h d t th
main g m d bl d th t l g s p t

s e t d t th t mp m d b l a f N t th
d fullnes f th l ft d f th f b Th
d t t d l d cat th pos t f th g ft th t p p d
p t th bo y p t f th g ft wh l th
! p t h t l g po t f th
g ft

posterior fragment (T ble III) It is essential that this space retention be maintained until the complete soft tissue healing. Otherwise as soft tissue healing occurs there will be progressive displacement of the fragments by the pull of the new forming scar tissue and the various muscles. This displacement will interfere with later repair by bone graft. This condition is especially common where mucosa has been removed and a granulating wound has been left inside the mouth to heal by secondary intention.

Restriction of the defect Many patients have apparently been content to continue with what has the defect in the mandible repaired. In some instances it has been possible for them to wear dentures. Unquestionably the patient is more comfortable and his situation is more normal if a repair of the resected area of the mandible can be obtained with bony union. A number of methods may be employed but in general free bone graft is the most desirable procedure.

In order to carry out the procedure of a free bone graft satisfactorily, certain things are necessary. The fragments of the mandible which remain must be free enough so that they can be not only placed but also maintained in their proper position during the time that the bone graft is being in place (Fig 7b). It is tremendously important that the contour of the bone be adequate in quality and amount to give good contour

and nourishment to a bone graft. If the overlying tissue has been damaged to the point that it is scarred and tight, the graft is likely to be extruded. If it is necessary to dissect dense scar tissue from between the ends of the bone before they can be restored to their proper position, then this must be done prior to the insertion of the bone graft to prevent mouth contamination. In certain instances it may even be necessary to apply additional soft tissue by means of flaps (Fig 8) to replace scar or to supplement inadequate covering material which is present. This is done prior to the insertion of the bone graft. This is well illustrated in one patient (Fig 8) who had lost two bone grafts because they were placed in dense scar tissue.

The bone graft may be either massive, using the half or full thickness of the rib or a section of the ileum, or it may be thin, as in the case of the osteoperiosteal graft taken from the tibia. This type of graft may be applied in several thicknesses. Regardless of the type of graft used, it is desirable to overlap the ends of the mandible with an inch or so of the bone graft. Here possible making the bone graft two inches longer than the defect. In some instances the portion of the graft which overlaps the ends of the mandible may be thin while the portion between the ends is thicker. Sometimes a T shaped graft may be employed, the thick arm of the T projecting in between the

end of the mandible. In all instances the bone grafts should be in as close contact with the mandible as possible and anchored to soft tissues or even to the bone itself with silk or fine tantalum wire sutures.

Where there has been a disarticulation of one side of the mandible a rib graft containing cartilage and bone can be utilized. The cartilage end can be fitted into the temporomandibular fossa and the bony end attached to the remaining mandible (Fig. 9).

SUMMARY AND CONCLUSIONS

The ameloblastoma arises from the enamel organ in a particular phase of tooth development, namely morphodifferentiation. Because the cells from which this tumor arises are not yet differentiated into ameloblasts the term *preameloblastoma* is more accurate.

This tumor is found most frequently near the angle of the mandible in young adults. Although the clinical history and roentgenographic findings are an aid the final diagnosis depends upon microscopic examination.

It is slow growing and unless completely removed will continue to grow (rather than recur). The ameloblastoma seldom becomes truly malignant.

Curettage and cauterization with drugs and radiation are inadequate therapeutic measures. The lesion should be (1) completely enucleated if unilocular (2) cauterized by heat if not too large and multilocular or (3) if extensive resected including a small amount of normal bone. The latter are the best method of treatment because they give the greatest assurance of no tumor being left.

The surgical approach and procedure for various ameloblastomas and the necessary subsequent reconstruction surgery have been considered.

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 S R 83 343 B C d Sc tr l J Am D t A
 8 Ib d 194 9 67 7 939- 000
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 94 64 7 88
 Schmitt F C d B R E D W E J O
 Surg 1943 8
 Smith C C A S g 928 88 693 4
 Tru M K R H O I I th l gy d d St L
 C V Mooby C 944

BIOLOGIC INVESTIGATIONS OF A NEW ABSORBABLE SPONGE

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RECENT reports on fibrin foam (4, 9) and oxidized cellulose (2, 3, 7) indicated that a material with the properties of a sponge that could be absorbed by the animal body might have utility in the general practice of surgery.

In a preliminary paper (1) there has been announced the preparation of a water insoluble gelatin based sponge which fulfilled the requirement of an absorbable matrix. The purpose of this communication is to report the details of our investigations pertaining to the biologic uses and tissue responses to this new substance.

The physiologic absorption of catgut has been shown by Jenkins (5) to correlate with its enzymatic digestion *in vitro*. Gelatin sponge was found to digest *in vitro* in pepsin solution. The digest time was influenced by the mode of manufacture to the extent that some specimens digested in 10 minutes while undigested fragments of others persisted after 24 hours. There has been obtained evidence that the sponges which required the longest time to be brought into solution by pepsin *in vivo* also demonstrated prolonged physiologic absorption in living tissues.

Most of the animal and all of the clinical investigations including a recent report in this journal (6) which have been made with gelatin sponge to date have employed material from lots which were standardized such that a 100 milligram cube of sponge was completely digested in 100 cubic centimeters of a 1 per cent solution (0.37 per cent HCl as solute) of USP pepsin at 37 degrees centigrade in 30 minutes or less.

Many different sized molds have been prepared from the foamed gelatin. The tough porous nonbrittle sponge after drying was

packaged and sterilized in the package by standard dry heat procedure. If autoclaved there resulted a complete loss of the desired physical properties. The final product could be handled with sterile technique and further cut to any desired shape and size (1, 2, 3).

Pledgets were found to wet readily by dipping them in a solution and kneading vigorously in the fingers or sterile gloves for a few seconds. When the damp mass was returned to the solution it rapidly imbibed fluid and assumed its original shape and size. It was our practice to wet sponges in the particular solution which we wished to carry to an implant site.

An experiment designed primarily to ascertain if this slightly denatured protein material would be physiologically absorbed was conducted with 21 albino rats weighing about 300 grams. Sterile precautions were taken. The animal were anesthetized with ether the outer surface of the left hind leg shaved and prepared with an antiseptic solution (mercuricresin). An incision about 3 millimeters long was made through cutaneous subcutaneous and fascial layers to expose the femoral muscles.

With a blunt instrument the muscle layers were divided and a dampened piece of gelatin sponge (6 by 8 by 8 mm dry) was introduced. Well above the deep implant a silk suture was taken to insure closure of the muscles and mark the site. Silk stitches were used to close the cutaneous wound.

Animals were killed each week and reopened for inspection. At 1 week the discolored sponges could be readily identified. At 2 weeks they had lost much of their original size and appearance. At 3 weeks only a small transparent gelatinous spot could be found at the implant sites. Nothing could be identified 30 days after implantation. In all 21 cases the wound appeared clean and well healed with no evidence of reaction that could be attributed to the sponge.



F. Absorbible gelatin sponge. The illustrations indicate how the material may be cut to any size and shape to fit the type of application.

The blood clotting enzyme thrombin has been recommended (8) as a useful hemostatic agent. Its clinical utility has been shown (4,9) to be enhanced if the thrombin is applied in an absorbable porous matrix that does not require removal at the time of wound closure. Such a procedure eliminates the danger of reinstating bleeding due to the need of withdrawing a dressing.

To gain information on the possible hemostatic properties of gelatin sponge when used in conjunction with thrombin, studies were made on the control of escaping blood from several artificially provoked bleeding points. In one investigation 6 rats were anesthetized with ether and the livers were exposed. In the left and right lobes of the liver stab wound were made of sufficient severity to produce a free flow. Small pieces of ordinary gauze were packed into the cut in the left lobe. Into those on the right were inserted pledgets

of gelatin sponge which had been wet in a thrombin solution of a potency of 300 units¹ per cubic centimeter. Before insertion the wet sponges had been entirely pre-soaked in sterile gauze or towel so that they held as thrombin solution only about 5 per cent of their potential liquid engorging capacity.

On the gauze-filled wound, 5 either continued to bleed or hemorrhage started again upon withdrawal of the pack. Only one indicated a control of the hemorrhage. Bleeding from the wound packed with thrombin damp gelatin sponge stopped in 2 minutes or less. The packs were not removed since removal would usually be contraindicated in clinical practice.

Often the sponge pledget that served for hemostasis on the surface of a wound once there was no overlying pressure appeared bulky because of engorged blood and exudate. After a few moments when the clotting was complete pressure applied gently but firmly to such dressing caused them to lie as thin films. Because of the fibrin now precipitated in the interstices of the matrix there was no further tendency to swell significantly.

Additional data were obtained by cleanly severing the tips of rats' tails and attempting to control the bleeding. Usually ordinary bandages did not stay the flow until considerable blood had been lost. Gelatin sponge damp with thrombin again demonstrated satisfactory control although the tail had to be adequately immobilized or the wound properly dressed to avoid mechanical loss of the pledgets.

Another investigation was designed to study further the hemostatic qualities of gelatin sponge with thrombin and by histologic examination to evaluate more thoroughly the biologic absorbability of the sponge as well as observe any cellular or tissue reaction it might provoke. Also using the same animal and technique the physiologic properties of fibrin foam and a starch sponge were investigated.

Twenty-eight 300 gram rats were anesthetized by intraperitoneal injection of milligrams of cyclopentylallylbarbituric acid.

¹Clotting activity as standardized by human laboratory method using oxalated bovine plasma in seconds. ha 30 in 35 on 100 sec 150 sec 200 sec 250 sec 300 sec 350 sec 400 sec 450 sec 500 sec 550 sec 600 sec 650 sec 700 sec 750 sec 800 sec 850 sec 900 sec 950 sec 1000 sec 1050 sec 1100 sec 1150 sec 1200 sec 1250 sec 1300 sec 1350 sec 1400 sec 1450 sec 1500 sec 1550 sec 1600 sec 1650 sec 1700 sec 1750 sec 1800 sec 1850 sec 1900 sec 1950 sec 2000 sec 2050 sec 2100 sec 2150 sec 2200 sec 2250 sec 2300 sec 2350 sec 2400 sec 2450 sec 2500 sec 2550 sec 2600 sec 2650 sec 2700 sec 2750 sec 2800 sec 2850 sec 2900 sec 2950 sec 3000 sec 3050 sec 3100 sec 3150 sec 3200 sec 3250 sec 3300 sec 3350 sec 3400 sec 3450 sec 3500 sec 3550 sec 3600 sec 3650 sec 3700 sec 3750 sec 3800 sec 3850 sec 3900 sec 3950 sec 4000 sec 4050 sec 4100 sec 4150 sec 4200 sec 4250 sec 4300 sec 4350 sec 4400 sec 4450 sec 4500 sec 4550 sec 4600 sec 4650 sec 4700 sec 4750 sec 4800 sec 4850 sec 4900 sec 4950 sec 5000 sec 5050 sec 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Fig 2 Ph t m g ph f g l t p o () t h t
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Fig 3 I h t m g ph f m g l t p g e ()
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(cyclopal) per 100 grams of body weight. Both hind extremities were shaved and the areas painted with an antiseptic solution (merckresin).

Incisions about 5 millimeters long were made through the cutaneous layers in 4 different regions and the underlying muscles were exposed. All implanted pieces measured dry 5 by 8 by 8 millimeters. Those used in conjunction with thrombin were wet in a solution having a potency of 500 unit per cubic centimeter.

In area A the right leg the muscles around the gastrocnemius were parted and a piece of fibrin foam damp with thrombin was introduced. Occasionally a saphenous vein was intentionally ruptured the resulting hemorrhage was controlled by the fibrin foam thrombin pack.

In area B the right thigh femoral muscles were separated and the pieces of starch sponge moist with thrombin implanted. The material made available to us at that time had very little cohesive strength in a wet condition thus difficulty was experienced in making unbroken implants.

In area C the left leg was inserted gelatin sponge damp with thrombin. A main vein was often severed to create a bleeding which

the gelatin sponge thrombin combination readily arrested.

In area D the left thigh a piece of gelatin sponge wet with a solution of penicillin which had a potency of 5000 Oxford unit per cubic centimeter was implanted.

Rats were killed at 5 day intervals from the 5th to the 100th postoperative day. The implant areas were visually inspected and specimens fixed in 10 per cent formalin solution. For histologic study the tissues were embedded in paraffin and stained with hematoxylin and eosin. Using this stain on unimplanted fragments the gelatin sponge showed a mesh of purple fibers the fibrin foam a pink and the starch sponge a shade of pink.

The considerable data accumulated will be abstracted to present only the pertinent information and thus avoid being voluminous.

Fibrin foam implants by the 10th postoperative day were dissected as yellowish lumps which when cut in two appeared as heavy walled fibrous capsule containing the original pledgets. These lumps grew progressively smaller the longer the rats were maintained. A little nodule was found in one out of two examined on the 100th postoperative day. Histologic examination of this specimen showed a remnant of foam with evidence of the sur-



Fig. 4 Photomicrograph showing unabsorbed remnants of gelatin sponge (irregularly shaped) which were infiltrated by granulation tissue. The sponge fragments are partially resorbed.

Fig. 5 Photomicrograph of a rat muscle which previously had been implanted with a little spongy tissue. The tissue is well integrated.

rounding fibroblastic capsule. Cellular and tissue reactions to fibrin foam were comparable to those to be illustrated for gelatin sponge.

Gelatin implants could not be identified by gross inspection after the 10th day. However, the prepared stained sections demonstrated pink colored fragments of starch through the 30th day. No significant tissue reaction to this material was observed but the 40 and 50 day specimens revealed an extraordinary cellular infiltration largely of mononuclear phagocytes. The type of phagocyte that usually engulf lipid seemed to be attracted by this material invading and replacing it.

The physiologic response to gelatin sponge whether introduced wet with thrombin or penicillin were the same.

Gelatin sponge implants were observed gradually to become gelatinous and transparent in appearance as they diminished in size. No tendency to encapsulate was noticed. By the 6th day only small transparent films could be found, these contained brown red colored areas presumed to be hemoglobin residue from the embedded erythrocyte. Nothing was found by visual inspection after the 6th day and histologic identification of

any unabsorbed material was doubtful after the 25th day.

No untoward tissue reactions were noted in the muscles subjected to gelatin sponge. There was some cellular reaction that was interpreted as being of no greater magnitude than usually arises during the resorption of a naturally occurring blood clot from an uncomplicated wound.

Histologic section of a gelatin implant specimen at the 5th postoperative day (Fig. 1) showed the meshes of the sponge lying close to muscle tissue with very little evidence of cellular reaction. At 10 days (Fig. 3) sponge material was seen as were leucocytes and giant cells. At the 20th day sponge remnants were found along with infiltration of young connective tissue. By the 30th postoperative day (Fig. 5) no sponge was identified by histologic staining; the cellular reaction was subsiding. In our experience cellular response appeared to become maximal in 10 to 20 days then recede.

SUMMARY

A water insoluble gelatin base sponge has been prepared. This matrix was found to be dissolved *in vitro* in physiological solution and *in vivo* to be physiologically absorbed.

In conjunction with thrombin gelatin sponge has been shown to act as a hemostatic agent for hemorrhages that were experimentally provoked in animals.

In additional studies implants of fibrin foam starch sponge and gelatin sponge were enclosed in rat muscle areas. At stated interval the operative sites were reopened visually examined and specimens fixed for histologic study.

The fibrin foam implants were not completely absorbed as indicated by histologic evidence by the 100th postoperative day. There was evidence of fibrous encapsulation of this material. No significant tissue reaction was observed. Cellular response was comparable to that observed in the gelatin sponge implants.

No starch sponge could be visually identified after the 10th day, but histologic evidence indicated unabsorbed fragments through the 30th day. This substance excited considerable cellular response particularly of the mononuclear phagocytes.

Gelatin sponges were soaked in penicillin solution and inserted in wounds. The absorb-

ed as readily as other gelatin sponge implants with similar physiologic responses.

Thrombin damp gelatin implants were absorbed by the 30th postoperative day as illustrated by the histologic data. There appeared to be no tendency for this material to encapsulate. No tissue reaction was observed. The gelatin sponge pledgets provoked a cellular infiltration which was considered to be no greater than occurs upon the resorption of an ordinary blood clot. The cellular reactions were found in these experiments to become maximal in 10 to 15 days and then recede.

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MICHAEL L. MASO

NOVEMBER, 1945

A recent editorial¹ on "The Ulcer Carcinoma Problem of the Stomach" Bygard stated that Gastroscopy is of no help because it provides merely the observer's visual impression which at best lacks the precision necessary in dealing with carcinoma. It seems to me that this statement is not quite fair to the gastroscopist because although he may make some mistakes he is sometimes able to give quite positive evidence that an ulcerating lesion of the stomach is malignant. When for example he sees a rather large ulcer with raised nodular margins and a dirty base over which peristaltic waves do not pass he can be fairly certain that he is dealing with a malignant ulcer. On the other hand when he sees a comparatively small ulcer with sharp margin and a clean base with no surrounding induration and no interference with the peri-

Unfortunately, in the case of most other diagnostic procedures it must be admitted that such evidence cannot be considered 100 per cent correct but the gastroscopic picture is of value when added to the x ray examination and the clinical data. In my opinion a more accurate diagnosis can be obtained in the gastric ulcer carcinoma problem when all methods of examination are used in a given case than when reliance is placed on incomplete data. Gastroscopic examination supplements x ray examination it does not in any sense compete with it. Reliance can be placed upon gastroscopic examination only when the method is carried out by an experienced gastroscopist who knows the limitations of the method, the relative blind areas in the stomach and the proper interpretation of his observations. If gastroscopy, x ray examination and the clinical data all point to a benign lesion we believe it is safe to keep the patient in bed in the hospital for a period of three weeks on a careful medical regimen, then re-examine by x ray and by gastroscopy and re-evaluate the situation. If there is any question of carcinoma the patient should be explored surgically. A fairly safe rule to follow with gastric ulcer is to consider it malignant until proved otherwise but I do not believe that it is fair to say that gastroscopy is of no help whatsoever in the ulcer carcinoma problem.

In a recent lecture Benedict studied 4 proved cases of gastric pathology in an at

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tempt to correlate the gastroscopic x ray and pathological findings. An analysis was made of 15 cases of proved carcinoma of the stomach in which it was shown that x ray and gastroscopic examination were equally good in 67 cases equally doubtful in 3 cases the radiologist more accurate or more helpful in 32 cases and the gastroscopist more accurate or more helpful in 20 cases. When the lesion was equally accessible to both methods of examination the analysis seemed to indicate the relative superiority of gastroscopy over radiology in differentiating benign from malignant gastric ulcers. In the same report 50 cases of proved benign gastric ulcer were also analyzed

and in 16 of the x ray and gastroscopy were equally correct in 9 cases equally doubtful in

1 cases x ray was superior to gastroscopy and in only 4 cases gastroscopy was superior to x ray. In both the carcinoma and the ulcer cases gastroscopic failures were due largely to mechanical difficulties which accounted for 25 of the 32 cases of x ray superiority in the carcinoma group and for 17 of the 21 cases of x ray superiority in the ulcer group.

In conclusion I believe that gastroscopy is of value in the ulcer carcinoma problem and that the most accurate diagnostic results are obtained when all methods of study are used cooperatively.

EDWARD B. BENEDICT

November, 1945

International Abstract of Surgery

*Supplementary to
Surgery, Gynecology and Obstetrics*

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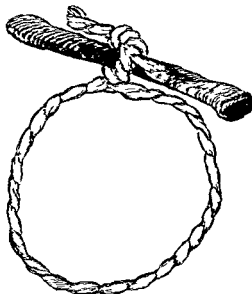


Fig. The garro Mirell (64) Spanish windlass first used in the Battle of Besançon.

pressure with a sterile dressing over the bleeding area or pressure along the course of the spurting artery may secure hemostasis.

As was noted before there are many types of temporary tourniquets. A form which permits adjustment of the constriction just beyond the cessation of the blood flow is desirable. The proper tension is very difficult to obtain with the Es-

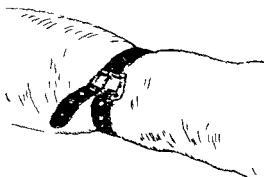


Fig. The tightened belt used by the British Army in the Crimean War.

march bandage or the tubin tourniquet applied in successive turns either excessive or inadequate pressures being the rule. Ball and Quist (12) commenting on air raid casualties in London state that although most of the patients with injuries of the limbs had tourniquets applied before admission to the casualty station in most cases they had been applied ineffectively and had allowed a slow steady ooze of blood. These authors believed that a firm sterile dressing applied directly over the wound would be of more value for routine use. A trial at adjusting the rubber tourniquet at reasonable level above the systolic blood pressure will show that variations of 150 mm. or more are frequent. Authors agree that the placing of an arterial tourniquet at the effective tension is a matter of practice. Also it must be re-

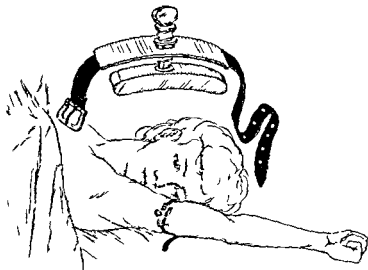


Fig. The screw type tourniquet, 78

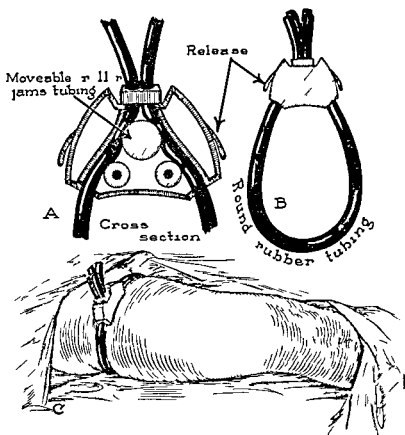


Fig 4 Rubber tubing tourniquet. Shows in cross section how released by the blade. The device is made of rubber tubing in place.

membered that each superimposed turn of the Es-march tourniquet has an additive effect. This is easily shown by placing a blood pressure cuff about the arm adjusting the tens on to 90 mm Hg and then applying turn after turn of the Es-march bandage over it. The first and each successive turn raises the constrictive pressure by 30 mm or more according to the pull maintained on the free end.

The temporary tourniquet in contrast to the permanent one should be placed as far from the wound as is convenient (with avoidance of certain vulnerable areas) because it is often more difficult to apply and because its periodic release will disturb the wound. If possible the extremity should be elevated before each application to retain the blood contained distal to the tourniquet. Although no experimental evidence is available to determine the frequency with which the tourniquet should be released it is generally supposed to be at half hour intervals. The tourniquet

should be moved slightly each time to minimize the local damage. This interval also allows opportunity to note whether hemostasis has occurred which will make the tourniquet no longer necessary. Periodic release also diminishes the severity of the shock which as we shall point out follows release after prolonged constriction. The lowering of resistance of the tissues of the injured limb is also counteracted to a certain degree by this periodic flushing and reoxygenation of the extremity.

All persons with tourniquets in place must be regarded as surgical emergencies and be given hemostatic operative treatment at the earliest opportunity. Good field technique includes the administration of morphine for the pain from the arterial tourniquet and the use of care to prevent movement of the limb or slipping of the tourniquet which would result either in further hemorrhage or in damage to the local tissues.

A last point concerns the desirability of refrigerating the extremity distal to the tourniquet.

TABLE III — TOURNIQUET INJURY OF THE NERVES

(F m Eckh 893)

Age sex	Operation	Paralysis	Recovery	Anesthesia	Recovery
F 3	Fl Dig I	Cl Med.	m	N	
F	Flex Dig I	Cl Med.	3 m	amblyd	3 mo
F	Fl Carpal	Rad.	3 m	ne	
M 7	E Rad I H ad	Cl Med. Rad.	3 m	Tingling hand	dy
F	Wrist, Humerus	Rad.	6 m	Doubtful	
M	Fla Radius	Rad.	m	amblyd	3 da
F 5	Ex Fractum Humerus	Cl Rad. fed.	m	Talif re-m	wk.
M 7	Ex Cryst. W	Cl Med. Rad.	m	Talif re-m	3 da
F	Transplant. Cl	Cl m d. Rad.	m	Total re-m	da
F 3	S Brachy rad T d.	Cl Med.	3 m	ne	
M 6	S Fl Dig I	Cl Med. Rad.	3 m	Talif re-m	3 da
M	Fl ng Radius	Rad.	3 m	Talif re-m	m
F	Fl ng Radius	Rad.	m	Hand	da
M	Op Reduc Elbow	Cl Med. Rad.	mo.	Talif re-m	m

TABLE IV — NERVOUS TISSUE SURVIVAL WITH ISCHEMIA

Small cortical pyramidal cells	8 m n.	Complete Fl ()
Brain: human: frontoparietal	5 m n.	Myel ()
Medulla	m	Go. I Fl ()
Spinal cord	3 m	Complete Fl (34)
Sympathetic gangl	hou	Eh l h d Bragg ()
Myocardium	3 hours	Complete B l (30)

Following this period of elevation the cuff should be inflated rapidly to the proper pressure. Hesitation results in venous stasis and engorgement of the distal blood vessels. Inflation is often the duty of the anesthetist who is not aware of the necessity for decisive action. He need only allow the pressure to stay for a moment below systolic blood pressure to distend the blood vessels. The use of the long flat Esmarch bandage in spiral fashion to express the blood from the extremity before application of the tourniquet is helpful but usually elevation alone is enough.

The fifth and last factor which limits the duration of the use of the tourniquet is the effect upon release of the tourniquet. The restoration of the circulation is accompanied by a fall in the blood pressure (19) the degree of fall depending on the duration of the constriction, the condition of the patient and the amount of tissue rendered ischemic. Chart I from Wilson and Roome (36) shows the customary effect. In this case release of a tourniquet from the thigh of a patient after two and one quarter hours of constriction resulted in a sudden drop of 35 mm Hg in blood pressure. This drop must be avoided if the patient is in a precarious condition. The pressure rises again then slowly fall to slightly below normal. Table V also from Wilson and Roome (36) shows in detail the relation between the duration of the constriction and the incidence of death after release. With less than three hours of constriction none died whereas with more than six and one half hours of constriction all died. Table VI shows the effect of various forms of treatment on the shock produced upon release of the tourniquet. Without imputation all dogs die. If the treatment consists of amputation and blood transfusion the animal recovers. Blood alone does not save them. Blalock (133) has shown that in an era of 24 per cent of the total body weight removed as plasma at four hour intervals results in the death of the dog in an era of twenty-eight and one half hours. Milon et al (43) obtained similar results on release of tourniquets from the hind legs

The interval between deflations will vary with each case but a half hour interval is safe. This is also true in plastic surgery in which the viability of skin flaps is questionable. The safe period is said to be prolonged by packing the base beneath the limb and irrigating with cold saline solution.

The length of time the cuff must remain deflated to allow reoxygenation of the tissues has not been determined nor do estimates appear in the literature. Three minutes is a reasonable time. Shorter periods would not allow adequate exchange between the intercellular fluid and the blood. A longer wait would prolong the operation unnecessarily.

Elevation of the extremity before inflation of the cuff is customary. As a result the venous ooze during the operation is decreased and a certain amount of useful blood is restored to the circulation. Prolonged elevation brings about a physiological compensation with vasodilation which cancels some of the gain. Too brief a period of elevation does not allow maximum fall of the venous pressure. Three minutes is generally accepted as a reasonable period.

TABLE V — EFFECT OF DURATION OF CONstriction

		(t	W l s	d Room	936)
Number	f d g s	Du	t r s	R l	
			<3 h r s	d d	
			3 to 6 h r s	d d	
5			>6 h r s	All d d	

of do s The rather direct relationship between the amount of fluid lost into the constricted or traumatized leg and the development of shock suggests that the phenomena following release of a tourniquet after a long period of constriction are due in the main to loss of fluid from the general circulation into the extremity because of the increase in permeability of the capillaries due to the ischemia (53). The application to operative surgery is obvious: the period of ischemia must be limited and the ischemic area must be kept as small as possible. When the cuff is removed the patient should be watched carefully for a precipitous fall in blood pressure and be observed for a later gradual decline in this pressure. Patients who are in or near shock should have tourniquets applied for short times only with frequent deflation of the cuff. As Davis (22) stated: "We have had an occasional drop in blood pressure upon release of the constriction and are familiar with other instances in which the patient developed profound shock immediately after this procedure."

The danger of shock and of damage to the tissues rather than injury to the nerve and skin or gangrene is the limiting factor to extended applications of the tourniquet. Four hours is a safe period to maintain constriction in the operating room and should cause no damage.

Effect upon the local tissues by the cuff. Local compression of the tissues is effected by two factors: the width of the cuff and the pressure of the cuff. The desirable width of the tourniquet has not been established. Allen (7) advocates a narrow tourniquet but does not take local damage to the skin sufficiently into account. A wide tourniquet on the other hand distributes the pressure over the unequally yielding tissues and does not cut into the skin. Lagan and Bordley (47) have shown that a narrow sphygmomanometer cuff gives blood pressure readings which are too high. It follows then that it takes a higher pressure with a narrow cuff to stop arterial blood flow than with a wide cuff and so the narrow cuff leads to greater damage of the tissues. This is supported by the work of von Recklinhausen (48) and of Norris and his co-workers (49).

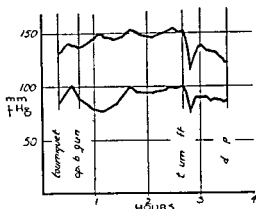


Chart I. Effect of tourniquet on blood pressure (F. M. Wilson, D. Room, 1936)

The factors governing the pressure to which a pneumatic tourniquet should be inflated are often misunderstood yet are obvious in principle. An arterial tourniquet is used to stop arterial blood flow. The level of from 240 to 260 mm Hg most often used was chosen to be above the systolic blood pressure of all but the most severe hypertensive patients. Blood may escape under a cuff set at 240 mm but such pressure is not needed in most cases. Lahz (38) who alone discusses this question believes that from 10 to 20 mm above the preoperative systolic blood pressure is enough. A different conclusion is reached from a study of the blood pressure records of 137 consecutive operations at the Cincinnati General Hospital 100 of which were performed with general and 37 with local anesthesia (Chart II). The preoperative systolic blood pressure is charted against the rise during operation above the preoperative level.

TABLE VI — SURVIVAL AFTER RELEASE (F. M. Wilson, D. Room, 1936)

Duration of Constriction (hours)	Tissue	Survival (hours)	Weight (pounds)
Blood and saline solution	6	7.3	
Blood and saline solution	7		
Plasma	3	6	
Plasma and saline solution		6.5	
Amputation hours release blood	Recovered		
Amputation hours after release blood	Recovered		
Amputation hours release no blood	8		
Amputation hours after release no blood			

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- 56 W LSO H nd ROOME N W A h Surg 1935
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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Woodhall B and Spurling R G Tantalum
Cranioplasty for Wound of the Skull
J S 2 1945 649

As res it f the l ge number of cran l injuries
a ta nel in the p es nt w r interest in treati g the
Se eral new methods of cr n oplaty which ha ap
pea ed in the past f w e rs include the use f plas
tics tallum nd tantalum Of these tant l m
has become the most p ular becaus of its ine t
ness and th eas w th wh ch it may be handled Al
though methy lm thacrylate and vitall m may be
equally inert the f me has recei d only a l mited
appl catio and the latte more d fficult t use s
it must be cast

At Walt r R d General Hospital Wash ngton
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peri d of el n m ths and one half of th m w r
ret med to dy In th Army the nd cat ns f r
cran plasty a e m l a t thos in civil pra t e c
cept f r on tem—the \ my r gulat n t tes th t
a and v l l ith a cr nial def ct of m e than 3
m diameter r y not be ct rned t d ty In
c ilp act ce such small d fect uld ft t m le
c nsidered f little cons quence

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n l cou t r dye i p r d ith z co h d m te
Th plate is s dg d nt shape by j ess e k nk
n l f r s b el m nated by hamm g Th
pl l hed pl t with ngle hole i th l d a d
ter l d an aut clav

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t n and l ral r pars carried t f th n
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l g and f at w s ec d w th t gul r
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suggest n is the ins t n f t tal m f l t th

frst pe ati n to pre ent adhes ons between the
calp fl pand the n d rly i gt es

An lect ncephal graphic study f the po sible
ff ct f cran ioplasty upon a convuls v state was car
red out n 6 ca es These w re select d cases con
trolled by c nservative tre tment f wel e ca es
showed no ch nge in the lectroencephalog aph c
patt rn o showed an imp v m nt in a prev ously
ab mal c rd and r revealed an ncreased abnor
mal cord with the de elopment f p leptoge c
foc J ck I Wool MD

Pugh D G Fibrous Dy pla ia of th Sk ll A
P bable E planati n f Leonti sis Ossea
Rad l gy 945 44 548

Lesio s f the skull associ ted with p lyostotic
fibr us dysplasia (Fig 1) have a characteristc r e t
g log cal app arance Fibrous dyspl sia f th
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f brou dysplasi of the bones of the sk ll f u d
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h uld be ca d ut In mo t cases it seems p ob

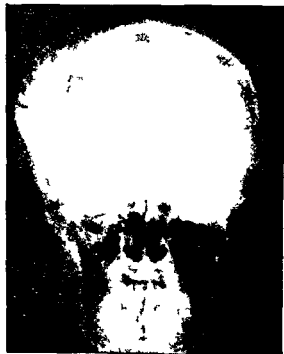


Fig 1 P lyostotic fibr us dysplasia. Th pat t had
typ cal fibr us dy pla ia f m ch f th k l ton.

controlled treatment with thiouracil cleared up the condition

Fibrillation and cardiac decompensation in the thyrocardes were noted in patients. Compensation with normal sinus rhythm was restored after six weeks and eight weeks respectively of thyrotherapy.

The case was a unique planned instance of resistance to the program.

The data presented in this report demonstrate clearly the effectiveness of the program in increasing and maintaining a state of remission in patients with thymoma.

M THIAS J SEIFE T M D

Er h J B Th Tre tm nt fExt n Cicatricial
St n i of th L rynx r th Trachea A h
Path Ch c. 04 45 343

Extensive catenation of the larynx in the upper part of the trachea usually can be treated most successfully by an open operation through an incision in the neck, which does not expose the most accurate section of the thickened cartilage producing the stridor.

In those cases in which this precise method of re-establishing the normal dimensions of the larynx and the tracheal lumen is to be employed, it is not only advantageous to delay the tracheostomy treatment into the cicatrization stages (1) the urgent removal of the cicatrix (2) the mechanical prevention of a tendency toward narrowing or constriction of the normally dimensioned (a long period usually 3 months) and (3) the plastic closure of the extralaryngeal opening.

The difficulties which arise in the case of patients during these three stages of treatment which are discussed in length are due to the different techniques which a capable producer of dental results but to the lack of simplified form fitting material with fewer moving mechanical details and fewer operative phases.

The author has developed a plan of therapy which has been experimentally compared with a plan of therapy which is acceptable to the patient because it either causes discomfort or requires any form of invasive examination or manipulation during the procedure.

could save of the time that would have been produced
gratifying results in high percentage of the cases
N. A. D. F. 1. 7. 1940

N 4H D F 1 T M D

Harriso M S D s e e of the Cervical Spl i
Laryng logical Practice J La Ot i Lo d
945 59 301

Three cases of dysostosis of the cervical spine are described. In an osteoarthritis of the cervical spine with marked lippling of the vertebra produced a peculiar feeling of the thoracic cage and stiffness of the neck. The lippling is demonstrated on

In the e d c s e o m v l t s f t h e f u r t h a d
f i f t h c e r v c a l v t r e b r a e d v l p e d w i t h a s u d d n
s e t T h e s y m p t o m s f i r s t a p p e a r e d r i n g a t g v
u l c r a t i n g r a n u l u g l e s o n w a s e e i n t h e g h t
p r i s r m f o a j u t b e l w t h e l e l f t h e r y s t
c a t i l a g e T h e l e s o n f t h e v t b r a e e d e m o
s t a d b y r o e n t n g r a m E p d r a l e t e o n s
i d c a t e d b y e n s o r y n d m t r h a n g e s i n t h e p p e r
a n d e r l i m b s T r e a t m t a c c r d o u b t b y e c k
f i x a t i o w t h p l s t e r o f P a i c l l a d i n g e t o
o p e n c i l l i n o o o u t s e r y f u h r s f o r s v d y s
a d a f o r t g h t t r a i r t h e c r s f f u r d y
w t h a g o o d r e s u l t

The third case was that of a nine-year-old child
suffering from a nasal polyp. The patient had
a chronic throat infection prior to the onset
of the marked retrograde scoliosis of the cervical
region and head fixation. Some alkaline lithopne-
umotomies were present. A plate of Perinormet
was applied under anesthesia with traction to the
from for twelve weeks and sufficient midline sign
rally.

The cervical vertebrae are a less frequent site of osteomyelitis than the lumbar and dorsal vertebrae. The majority of cases are hematogenous in origin.

small number are due to direct infection from a
 infectious process in the pharynx. The taphylo-
 cocci in the commensal flora of the pharynx are
 absent in a community and the bacteria may be
 present in the posterior triangle of the neck or pos-
 teriorly through the cervical muscles. An epidural
 spread is common with bacterial meningitis and a seg-
 mental epidural abscess is seen in the lumbar spine.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS CRANIAL NERVES

Kozl H L P traumat c Pers n lity and Psy
chiat ic Seq el a f Head I jury Categ ical
Pretra matic P rsonality Status Corr l t d
w/lt G l P ychiatric R cti n t H ad
I jury B d n An ly is of 290 C 4 h
A P y h t Ch 945 53 358

Th med cal pr fessi n and especially the psych a
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hule others do not It was Symond ho said It
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the ki d f head Th t cl from the N l
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psych t c symptoms L s tat d t t h t k
h story of pate s of val i estim t gth p e
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n tal symt m A i v go v M D

F l w L T P i llin A An Adj ct to S rg ry
l th T eatm nt f Brain Ab es AR po t f
6 Ca S h J f 945 38 3

The auth report s es f 6 f tracr a
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p l l S n d go Cal f m Th i th g g

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Operat d Cas L y f p 945 55 9

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An anterior cutaneo b nch of the femoral nerv
f app opriate l ngth s ed to b idg the gap N
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ut s d A gold leaf d es ing is ppl ed an l this
m st be car f lly ch ng d a d s perved

For i tients w th Bell s pal y who h e lost th r
respo et the f rad curr nt the decomp es ive op
rat n th j l t ng f th h th s empl yed
f nct n usualy turn n t o o r th e m nth
time G l cma ge empl y d afte treat
m t w th pport f th fac l m cult t y
m n fa hook n th corn f the m th faste d
t h d b nd D l g nt exerc es fr nt of m r
ar comm f l A V ch M D

was in the alveolar walls. Opponents of the theory hold that these neoplasms arise from a single focus probably in a small bronchus and then metastasize rapidly to other parts of the lungs by way of down growth in the bronchial tree and by extension through the pores of Kohn through lymphatics and the blood vessels.

In spite of the argumental position the authors believe these reported cases differ from other forms of pulmonary tumors that they should be given special consideration.

The majority of alveolar-cell tumors are malignant but some are benign. Histologically they resemble Sims-Bill-Taft and Jackson reported cases probably of this character call them bilateral multiple pulmonary matosis. Extensive differentiation of the alveolar and pulmonary mucous epithelium hyperplasia. The third case reported here was somewhat smaller with a lower grade of histological malignancy marked mucinous secretion and abscess formation and distant metastases.

The clinical features of this tumor are similar to the following: cough, bloody sputum, pain in the chest, pleural effusion, anemia, enlargement of lymphatic nodes, the outcome may be fatal because of the involvement of large lymphatic vessels, urinary processes. The prognosis then is unfavorable in the overwhelming majority of cases. Although lateral or multilobar tumors may be amenable to surgical excision.

Macroscopically these tumors consist of an plastic columnar or cuboidal epithelial cells that are fully cellular, preserved alveolar wall and framework. The cells often form papillary projections. Mitoses are present. Occasionally necrosis reveals tumor cells in the sinusoids. Thrombosis inflammation and easily abscess formation are often seen. Giant cell fragments of nuclei and desquamation of tumor cells into the alveolar lumen are seen. The lymphatics often contain tumor cells. Periodic acid fastness and mucin secretion are common. Matted fibrous tissue of the interlobular septa may be broken up. Alveoli may contain macrophages and leukocytes.

From the routine logical position few the problem appears of the alveolar-cell tumor makes the difficulty of clinical diagnosis evident. The ontogenetic origin probably may be lateral bronchogenic carcinoma metastasizing to lung, tuberculosis infection of the pneumothorax, bronchiectasis or cavitation, effusion, direct resorption of the tumor and metastasis. In practice often complicated by hemorrhage associated with thrombosis, hyperemia, torulosis lead to further difficulties in diagnosis.

Clinical features such as lack of loss of weight, progress, weakness, dyspnea, cough may tip the scales in favor of tumor diagnosis but as for alveolar cell tumor of the lungs is concerned the diagnosis in the majority of cases is beyond the realm of the ray differentiation and can be made

only by microscopic examination. However, the patients with multiple nodular pulmonary metastases without evidence of primary tumor, where this metastasis should be suspected.

ROTHBERG W. M. D.

Jackson C. L. Knezelmann F. W. Davidson, C. M. Bronchial Adenoma. J. Thorac. Surg. 1945 4 98

The authors recently reviewed the records of 20 cases typical of the clinical and pathological entity known as bronchial adenoma of the bronchus and they present them in alphabetical order of these cases in a table in this article. The symptoms are usually hemoptysis and cough often productive. The benign gram-negative bacteria are usually found generally in wedge-shaped atelectasis and occasionally effusion. The ages of the patients varied from thirteen to forty-four years and 80 percent of the patients were women. Bronchoscopic biopsies were done in all of the cases but the tissue was by means of smears directly the first time the slides were examined. If it was so questionable testing not the random diagnosis made by different pathologists and on different occasions by the same pathologist for many of the cases. The authors believe that they have made some progress in diagnosis and stand ready to criticize if diagnosis is possible through clinical with the mind.

Numbers of contrast to the recent literature have tended to cause confusion among pathologists as to the degree of concern with the histological structure of these tumors. Bronchial adenoma shows a peculiar epithelial proliferation in equally peculiar forms.

1. The cells are cuboidal, sometimes enclose multinucleated as a glomerular variety and spaces. They may form two or more layers or fill the space entirely. Within the first layer are often polygonal cells and they may be present freely or irregularly. The cell lines are so closely packed that cytological smears are unrecognizable.

2. The cellular round or oval with flat light gray with delicate chromatin markings that may frequently be seen in the small with deep stain so that the chromatin markings are not distinguishable. Mitoses are not seen.

3. The tumor cores sometimes are dense fibrous tissue with shrinkage of the cells and pinkness of the nuclei. The nuclear thin and shaped stainable black and dark self-packed.

4. Occasionally they rapidly grow to form the glandular pattern so late.

5. Sometimes papillary like masses are there as cords of cells with epithelial arrangement of the solid blood vessels. These are not to be looked like the pseudopodites in the metastatic metastasis. Osmic acid is impeded by the coagulation of size of the nuclei. The epithelium when regressed has occurred (F).

The stroma is fibrous and poor cellular where regression has occurred but frequently is rich in

capillaries and shows interstitial hemorrhages and proliferating fibroblasts are found to invade the clot and surround the tumor masses. It may be that these fibroscars which promote regression in the denser areas often contain hemosiderin deposits. Where hemorrhage has not occurred the capillaries wind in and out around the acellular structures which gives a picture closely resembling fetal lung. Rationally the active proliferating capillary endothelium which may show mitoses will confuse and lead to an erroneous diagnosis. The authors have encountered both a decartilage in the tumor but neither have they found proliferating glomerular cells. It is believed that these tissues are incidental and not a true part of the tumor.

The authors believe that these adenomas may infiltrate the bronchial wall or any tissue in their path. The infiltration is sufficiently frequent and limited when it occurs that endobronchial removal is justifiable when possible. Complete removal often is impossible and if complete the tumor recurs. However, repeated removal does not seem to cause a rapid growth or alter the behavior of the remaining cells. There is no evidence of metastases caused by the blood or lymph stream. It is possible these tumors may become malignant but the authors have never seen malignant change occur. Diagnostic accuracy depends on the pathologist's seeing the whole picture and the extent of the tumor. A small or numerous fragments if large should be studied by serial section.

Since the clinical picture may only suggest the final diagnosis in the cases most made by bronchoscopy with biopsy. Needle biopsy is adequate and lobectomy and pneumectomy may still be necessary to be done to establish the diagnosis regardless of the indications for lung resection in the patient. It is well known that 75 percent of lung carcinoma cases are subject to a bronchoscopy biopsy. These figures do not apply to all of the cases they characterize. Typically, the port of the bronchial electrode is blind to bronchoscopic picture.

Once the diagnosis has been made serially, the bronchoscopes should be done to relieve the bronchial obstruction. This is accomplished by pneumatic retractor mobilized electrocoagulation or a combination of both. Electrocoagulation produces less bleeding and is safer and more efficient in most cases. The authors' stenofunctional advantage is still terminated by removal with electrocoagulation.

When the tumor can be removed by bronchoscopic ally, the drainage area decreases and the distal bronchial tree may be radical resection may be postponed. All patients should be kept under observation and re-examined at intervals. Complete removal of the bronchoscopic disease is difficult in many cases. Inoperable tumors that resist treatment are urgent and the use of pneumatic retractor mobilized electrocoagulation. In many cases the bronchus will maintain patency with the treatment of the tumor. The authors believe that the bronchoscopic treatment of the tumor is the best method.

The authors believe that lung resection is indicated in (1) cases of bronchial adenoma in which because of sessile attachment and size bronchoscopy removal is not feasible and (2) in cases in which cavitation bronchiectasis or other severe damage to the distal portion of the lung has resulted from prolonged bronchial obstruction.

A very different situation obtains in the case of bronchial adenoma in the case of carcinoma as far as ureteric is concerned provided drainage and aeration can be reestablished. The adenoma is slow growing, does not metastasize and does not have a inherent tendency to become malignant. A contrary opinion has been due to error in histopathological diagnosis. ROBERT R. BIGELOW, M.D.

Graham E. A. and W. Mack N. A. The Problem of the So Called Bronchial Adenoma. *J. Thor. Surg.* 1945, 4, 106.

The so called bronchial adenoma is now known to be a common tumor with well recognized characteristics. It nearly always occurs in a primary bronchus and is enough to one to be visualized by the bronchoscope. At the base of a lobe or lung is common and frequently the bronchial obstruction causes an associated bronchiectasis. Women are affected slightly more often than men. A contrast to the preponderant male incidence of carcinoma. Usually the symptoms appear earlier than in ordinary carcinoma. In childhood a dactyloma of the bronchus picture is typical showing a smooth rounded pink mass within the bronchus projecting into the lumen of the bronchus. Often only a small portion of the tumor is endobronchial most of it being outside of the bronchus. Ulceration is rare even though the mucus is a common symptom. There seems to be a strong association of bronchial adenoma with other congenital lung abnormalities such as absent interlobar fissures or excessive lobulation congenital cystic disease or abnormal bronchi.

There is a fairly definite microscopic pattern. The tumor is composed of the bronchial epithelium which often shows squamous metaplasia. Directly beneath the tumor is a fibrous tissue layer of varying thickness. The tumor mass consists of cells with scant cytoplasm and small round nuclei with clear nuclei with rare mitoses arranged in a singly or in small pulmonary colic. These lesions are separated by a stroma of blood vessels and loose edematous fibrous tissue. The cells resemble normal like and the same as the similarity to hypernephroma which probably accounts for some misdiagnoses. When the stroma is excessively vascular the tumor appears glomerular and has often been diagnosed as a dermoid. In some tumors the stroma has been demonstrated by mesodermic cells with the resistance to the fibrous smooth muscle of the fibrous and hyaline cartilage. In venous have been seen in the tumor sections of the firm texture. The cryostat preparation.

The striking resemblance of these tumors to the fibrous suggests that they may be derived from the same

gan edembryon eb ds whi hha ef sled t de l p normally or hav atr ph ed The f t that these ad nomas have m ny ch racterist cs lke the mixed tumors of the sal'ary gland led t the authors calling them mixed tumors of the l n r 1 938 These charact ristics a e the p esenc of cart l ge or bo e the t ndency to m oke n hborn tis ues di ectly and th occas l t m formati by the connect ve tissue elements Pathologists m ht quest on this last charact ristic but th authors be l eveth t many cases f cho dr m fibroma l poma myxoma a dev n sarcoma of th l ng o j n te in the so-called a lenoma or mixed tumor of the bro chus but in wh ch mesodermal leme ts pr lferate w th th corresponding epith l prolif rati n

In acc danc with the uth rs id a two ma n groups of pulmonary tumors can be th ight of o ccurring because of fa lut f a br chial bui to d elop into a norm l ad l t arra gement of t s u These groups are (1) thos i wh ch mesod rmal elements p edominate such s pulmo ary chondrom steoma fibroma l pom ng ma myxoma a d sarcoma and () thos in whi h ntod rmal (or epithelial) elem nts a e dominant illust ated chiefly by th bron hial adenoma This w uld expl n th ex trem freq e cy with wh ch p th hial elem nt s found in the so-called chond oma f th lung a d mesodermal elements r found n the epith lal tumors

The chief lin cal problem concerning these tumors is wh th r they a a tu ally o potentially inva v If on accepts in as n of the d j cent tissues r go a l lymph nod in olvement and dist nt metas tases as criter a f malignancy n th l ht fcon d erable experie ce o cann t d ny that there have been cases i wh ch thes tumors b cam mal n t

In 938 the auth rs puni was that these ad nomas wer pote tially m l n t and they e p rted cases n which in as n f th adjac nt t sues or in ol em t f th regional lymph nodes occurred Kirch o Pe n M lkw tz And rson Stowell and Ad ms St uer and Block ll hav e reported cases of m l gna t cha ges in so-call d lun ade omas

The auth rs p ese t a case wh h an d noma had pursued a b n gn cours for mo than tw nty years before t b cam m l gna t At on tim it appeared that the t mo had been complet ly moved thr gh the br ch cope but an t n carcino ma with l er m tasta s e tu ally d el ped

An ther ca s p es ted n wh h b h d gn sis f a mi ed bronchial t mor m d p chiefly of epithelial elements w s mad by bro hoscropy A t tal p eum nectomy was d ne w th d ficulty because th hilar gl nd e nvolved The diagnosis was confirmed by m cro p c ct a d t utops; two days lat r wh n metastat c a n m of the tracheobronchial lymph nodes a d l er was f und The auth rs bel th case s n raml of an de n ma f the bro h s hich ha become mal n t with metastases t th reo al lymph glands a d live They o jectur that if t had been s nearly

b fo e m tasta es de el ped t uld ha e been called a benign adenoma f th bron bus

The f al ca presented is of an ob truct ng p l lary t m r f the right uppe lobe bro chu f rion bronch scopy Th pati nt underw nt a right total pne m nectomy and re v r d Of great nt rest was th path l gical p emen s egro s m a tion re led n e idene f tum r in the dja e t lymph nod s The m cro cop c ect s sh wed an e trem ly bizarre mal gn ntum r of th lung n wh h both p th l l nd co n cti e eel ments wer tak ng part A hn l d gnosis of m m d b o chozenic ca c n ma and sarcoma s m de Th a thors b le e this to b an unstanding xample of a m l gna nt transi sm t of tumor wh ch i s e n e r l er would ha e been called a br n h al ade oma Mo e inte est g s th f ct that both ep th l al and c n cti e tiss e elem nt h v bec me mal gn t whi h is support for the authors theory that e the ntod rmal or mesod rmal l ement of a l t nt bron hial b d may take on th f t res of a propl sm and th t e the type of elem nt mav becom m l nant The presence of bone in th s mix d carcinoma and sarc m supports f rth the u e of th t r m m r d tum r of th bro h s

Th s tumors hen first s e are ussly fow l t b benign and s me of the ind viduals ha bor n them m y f ll th r normal l e spa the tumors n t bec m n mal n t Altho gh there is evide ce that a patie t ha h d symptoms from such a tumor for two ty years th s are to find a bronchial ade m at aut psy after m d l age The r ason for th s probably l e i th f ct that th m j rty of these tumors r become m l gn nt and often los th r m al d nty I this aspect a ad noma of th bron hu uld b m rely foll w ng th rul of what is ll established n re and to ad nomas of th b ast pr state th y o d a direct m

In n ew f th w l l e tabl bel m l n t a t pot tial t es rad cal surg cal emoval s clealy th p o cedure of ho ce Broncho op c rem l raly could be c mplete becau e f th fr qu cy with which la g pa t f the t m l o t ide of th bronch s Th r s th d d t h d r d f bro ch al perforat n w th b h cop c emo i If the t mo is n t c mply r m ed the r m m l t may late becom i vas v An the b j ct t local rem val is the c rta nty n m ny ca s t wh ther the tum r is actually mal gn nt t th t m of op rat n Tissue m ed by br n hial b ps may n t be lea ly mal n nte n wh the tumor has al ealy nvaded ghbor ng t s s g i lymph nodes B boscropy rem l m y be satisf ctory al o b cau e of th oc ated br n h ectasis suppos dly d e t br nch al b truct l th tumor r Lobert my will om t mes be ad q t but beca f th l cat n f th t m t tal pn m eed my will m r ft be necessary Ths f ed e by wh h f ed e nal lymph odes can be rem ed m e ea ly nd whch good risk p t e t s is ly l bly m e d x thal lobectomy R ext R. B low M D

Bloch R G Adam W E Th rnton T F and
Brya t J E Difficulti In the Diff entl l
Diag osl of Bronchogenl Carcinom J
Th a S g 945 4 83

Recently the inc asing inter st in lu gca c ma
has led to much improvement in th diagnosis of p l
mo ary t mors With bette x ray technique and
bro choscopy the dffe t t n from other l g
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f wer pati nts w th ndobr nch al cancer die b cause
of errone s d agnos s With mou t g experience in
the many cl cal and patholog cal va ations of such
t m rs and esp cially ith the desire for ea ly dis
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can not be definitely recog ized by consrvative
diagnost c m thods La ge scal rout e x ray ex
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origin but it is hoped that when these exam ation
of supposedly h althy indi luals b come un rsal
there may m g a preponderanc f s h le ns
o rth far d d nes now being seen

R t e hest fl o scoy a cas find g p o
gram f r t b rculosis the U rsity f Chicag
Clinics h s pr d most h lpful the d sco ry of
non bercurous chest inv l me t d the th rs
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and t m r i v l me ts Of 15 000 p tie ts g or
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tatic gro th while o e f urth w el t r d gno ed
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patients had compla ts u relted t th chest
Among h sp tal z d ca es pulm nary tum rs ha
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The f ct that cr as ng umbers f pat t a e
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d ffr e t l diag os s Th y l how fr q t fal
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If arly rci m lket b c l s des t
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dure symptom f long t m f t does th v ar
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disregarded by the patient Roentgenological e
aminations often will not d fferent ate them from
small tuberculous or n tub cul us i lammatory
lesio s Early penpheral les ns constitut 3 per
cent of the t al lung tumors and bronchosc py is
always negative in these carcinomas The pred ag
nostic history of some of th cases illustrates the
s ming nsignificance a d obscurity of early carcin
oma and some of the probl ms in more adva ced
lesions when complicat d by unrelated d sease

An impressive number of symptoms and find gs
have been described as those of bronchogen c carcin
oma but thes should not be taken as typical and
tainly d not pply to a lypenpheral tumors In
fact e en th x ray observat on f the developm t
of th tum r through arious stages may not only
h lp b t also obscure the diagnosis when there i
a resembl ce of tw r mo d eases in their various
ph es \ x ray exam nation wh le invaluable in de
tecti g the les cannot be rel ed on to differ ntiate
between neoplasm lung bsc s tuberculosis and
ther rar r lung n olvements Therefore surgical
e plorat alone in the absence of bronch sc p c
find gs ca l ad to a d agnos s and it should be
und taken e n in e rly cases when there is strong
eno gh po sibi lty of neopla m The x ray bserva
ti n through lo g periods seemed to emphasiz the
dagn t c d flic lts and it g e test sngle v lue
l s in the d scovery of the e ly p esymptom tic le
ns by ro time e m natio of l rge population
gr ups Ro t r R Br low MD

Schn id L a d R l man I I Idl p thic Spon
f n u Pn m th ra History f 100 Unse
f cted C Lad l gy 945 44 485

Th rters h b numpres d by th freq cy
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Ih t o-called id path c spontaneo s p eumo
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such p lmonary coll pse in the past however were
unduly alarmed bo t t h ng be n ad used u
cess nly t le d a t a t sed nary l f e

The th rs bel t that these cases should be
tr ted l k th acc d nts th y e lly are Once the
patient has reco red noth g mor s ious will
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Th right l ng wa in l e d n 55 cases the left
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Spontaneous pneumothorax may appear asymptotically as found in 5 per cent of the authors' series. Its discovery on routine chest roentgenograms may be assumed that the accident is more frequent than clinically appears.

Recurrents take place in about 20 per cent of the cases and in the majority recurrence was common in men over thirty years of age.

Spontaneous pneumothorax occurred more often in the authors' series during relatively slight physical exertion with the patient at rest than following undue physical stress or strains.

Röntgenograms of the lungs taken from most of the cases after expansion of the collapsed lung were negative in all but 4 instances. In the great majority of cases one cannot tell from the film that a pneumothorax ever existed nor could it be predicted from the film whether the patient would ultimately survive. On the contrary, numerous cases of bullous emphysema seen at the institution gave a history of spontaneous pneumothorax.

JOSEPH K. NARVER MD

Blair B. Hamilton, J. E. and Dugan, D. J.
Observations on the Treatment of Empyema
Thoracis with Penicillin. *Surgery* 94:5 7572

When the possibilities of altering the management of empyema by the use of penicillin are considered the questions of adequate drainage and irrigation are most important. The prevailing tendency in the treatment of empyema with penicillin has been to delay drainage and thereby decrease the chance of permanent operation in the case of a tuberculous form of the disease. Moreover, the use of penicillin will control quickly the pneumonic stage of the disease and consequently decrease the risk of an operative surgical intervention.

The evidence is indisputable that penicillin is a valuable adjunct in the treatment of empyema that arises caused by penicillin-vulnerable organisms. Systemic administration of the drug alone will sometimes cause cultures of the fluid in the chest to become sterile. Intrapleural injections of penicillin will temporarily sterilize an empyema cavity in the great majority of cases. However, combined systemic and intrapleural administration is desirable because the combination affects both the pulmonary and pleural lesions.

Probably penicillin will be extremely effective in bottling empyema for a time, but once pus is formed and continues to form, the first rule of the pleural cavity closure cannot be ignored. If the lung is not rapidly withdrawn the appearance of pus when conservative measures are employed the authors believe that surgical drainage is mandatory. Failure to observe this fundamental principle of drainage of the pleural cavity in empyema of the pus-fermented temporal role of penicillin will invite the serious complication of fibrinization. This occurred in 4 of 4 cases observed.

It should again be emphasized that the introduction of penicillin has not altered in any way the

fundamental principles of treatment of empyema and the details are changed.

BR. JAMES COLEMAN, MD

Blades, B. P. Nicillin as an Adjuvant to the Surgical Treatment of Acute and Chronic Empyemas.
A. S. J. 1945 67

ACUTE PLEURAL EMPYEMA

Observations indicate that when suppuration is caused by penicillin-vulnerable organisms intrapleural injections of penicillin will improve the results. If the pus contains thick pus, however, it is usually necessary to resort to surgical drainage to evacuate the material. If this is not a chronic empyema may develop a thick layer of fibrin, the pus then becomes a problem of cavity obliteration and removal of the debris.

As penicillin with penicillin therapy accumulates the therapeutic approaches will become restricted. A standardized basis upon which the authors' observations tentatively plan for the use of penicillin as an adjunct to the surgical treatment of acute empyema is suggested.

1. An injection of 50,000 units of penicillin may be given intrapleurally as soon as an infected fluid appears in the pleural cavity. It is important that treatment be withheld until the organism is positively identified. Thus, penicillin will prevent the infection from spreading into the chest wall. The drug is an initial bacteriological diagnosis will also rule out the possibility of a tuberculous infection.

2. If systemic penicillin has been employed during the pneumonic stage of the disease the author believes it should be combined with local therapy. It is admitted that many instances of penicillin failure will have subsided by the time a pyogenic becomes apparent. The advantage of the systemic route, however, is that the blood will contain a bactericidal substance which may combat spreading cell infection. In the author's practice the reference that systemic administration of penicillin held allays the combination of local therapy. This is true particularly in cases of streptococcal and staphylococcal empyema. Probably three intrapleural injections of 50,000 units of alternate doses is sufficient for local treatment. Before the penicillin is injected into the pleura, much of the infected fluid should be removed by thoracentesis. If the pus continues to form, a thick surgical drainage should be established. Temporary or permanent fibrinolysis of the pus does not alter the most important fundamental surgical principle in treating empyema thoracis, namely, drainage.

CHRONIC EMPYEMA

After adequate drainage has been established it appears that the local use of penicillin is important. During the period of observation to de-

te min bethe the cavity w ll becom oblite at d
thout furth r u g cal intervent n there is littl
danger of sp ead ng cellulitis or inv sive infection
C nt nued f ver d failure to g n weight and other
manifestations of seps s usually mean an und a ned
o nadequately d ained collection of pus No chemo
therapeut c agent can be depended pon t r place
p pr dr image in the tre tment of pyogenic
abscesses

Probably the most valuable role of penicillin in
the treatment of chronic empyem is the protection t
may afford against spreadi g infection when a rad
cal operation is u de taken f obliteration of the
cavity Wh n penicillin is u ed as a prophylact c
t for this pu pos it is impossible to make a p e
case evalu t n f its b nefits It seems r aso al
howe er that when o e is wo king thro gh an in
fected or pot nt ally infected fi ld pen cillin protec
tion may stien p e nt serious w und inf cti s and
th r complications

THE PREVENTION OF POSTOPERATIVE EMPYEMA IN CASES OF LUNG RESECTION

Since post perat e mpyem i th principal ca s
f both mo tality and mo b d ty after the esect n
f lung t s es it is reason bl to utilize pen cillin in
an effort to reduce the incidence f this rio s com
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of empyem foll wing p lmonary es ction and w re
disappo ted w th results It as g n b th
system cally d l cally b t there vas n post t
fence i 6 cases so t eat d that it vas d an app
abl eff ct upon the i ffection

R ecently t a thors h e had an opport nity t
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ubj cted t lobect my f pp rat di a es f
th l g

It is th auth mp ess that i th s ri of
cases the i cid ne of empy ma depend d nt ly
upon the success f clousu e f th b onch s If th
br nchu ope ed early du g the pot pe t e
course a er mpy ma d v loped If it did not
empyema as o d d r f t d d de lop aft the
remain g l ng had r expand d it was t r o
Th ly oth r j tual co cl n f m th s b
t et is th t pen cillin does ot guarant e bsol t
p rfectio f m postope t mpyem n cases
bj cted t l g res ct n

Jo J M L y M D

HEART AND PERICARDIUM

II er G J a d St w rt II J Th S rgical
Treatm nt f Ch n l Con trict P icarditi
N York Stat J M 945 45 993

Ch n con tr t ipe ica d t s s a d cha
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f th s t r ce w th n m l c a d c t n
th g and sm t n rem blng h a t f a l

Pick in 1896 empha ized th comm n find ng in
this d sea e of nvol em nt of the li er and a cite
and the efore it is often called by h s name

Th ide that u gery mght achieve result i a
d sea e which has resi ted the effo ts of the phys c an
i attributed to We ll who in 1895 sugg ted th t
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per ca d m Del rme an internist who seems t
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only sugg ted but ins ted bet e n the ye rs 1895
and 1898 that surgery be att mpted in this d e
H s ad ic howe er was not immediately f ll w d

Th ca e of the thick ned co tract d adhe e t
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of lesi ns The pe icard um is lw vs th ck n d but
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being slght i some re s mark d in oth rs The
thicke d pe icard um may b made up wholly f
fibro s t s ue o d posits of calci m may occu and
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sh ll It s tle c mp ess n of the he rt by it
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The clin cal man f tations comm nly a dysp a
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ment f the li e and a cites d edema f the feet
and ankles

In all of the ser s of 18 case here reported en
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was present i all of th cases

The le d gel s to a corr ct d gnosis are the i
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ic d opsy the lw p l a d blood pres res and
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and the elect ocardiographic findings of low oltag e
QR S complexes and T va es

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The 11 rats received 256 patients subjected to operation with a primary mortality of 9 per cent. Of the fatalities 25 occurred upon the operating table and 49 occurred during the immediate postoperative period. To have lost this fourth of the number of patients subjected to operation suggests that preoperative treatment adding to the perfection of cases and knowledge of and attention to all the details in the operative procedure has influenced profoundly the results of surgery.

The preoperative treatment and the details of operative procedure and postoperative treatment are discussed in detail.

JOHN E. KIRBY, TRUCK M.D.

ESOPHAGUS AND MEDIASTINUM

Rosan J. Infective Meg esophagus (Megacystis infantilis) A. H. A. G. J. form p. d. g. 1944 9 409

The author recently reported on a case of megacystis in a child seven years of age. At the age of nine months had begun to have dysphagia and vomiting. The case is illustrated with a photograph of the child and radiographic films. Megacystis is frequently confused with esophageal spasm of the cardia or lower part of the esophagus.

The author has collected 77 cases from the literature of which we have rejected as doubtful the other 63 considered authentic. Brief histories of these cases are given with a table showing the details of symptoms, treatment and results.

Megacystis may be considered only in infants and grad liv in other children. The chief symptoms are dysphagia, vomiting and pain. The vomiting is esophageal; the food does not reach the stomach and does not contain gastric juice. Inspiration of the contents of the esophagus into the bronchi may cause bronchitis or sometimes abscess of the lung or emphysema. These children may be treated as a mistaken diagnosis of bronchitis, current tuberculosis, pneumonia or pulmonary tuberculosis. Sometimes the shadow of the dilatation of the esophagus reaches into the mediastinum and leads to a diagnosis of traumatic aortic aneurysm.

Diagnosis may be made clinically by catheterization of the esophagus, copy or roentgenography or autopsy. The best method of diagnosis is by roentgenography.

The best method of treatment is probably dilatation with a rubber bulb filled with water through the technique which is described. This method has been used satisfactorily. Success at the Mayo Clinic.

A. REY, G. MO, A. M.D.

Hansen L. Med. J. Emphysema J. Am. M. 1944 3

A may reach the mediastinum by routes (1) along the falciform ligament of the neck (2) through perforation of the trachea (3) through the esophagus into the mediastinum (4) from the interstitial tissue of the lung. It has also been suggested that a may reach the mediastinum through a passage between the parietal pleura and the chest wall between the visceral pleura or the air may pass from the pleural cavity to the mediastinum.

When air reaches the mediastinum and is confined there it will gradually be absorbed. When under pressure it will pass however air always escapes from the mediastinum although the amount of the pressure is the only factor that localizes it. The air within the mediastinum is important because it escapes easily from certain locations and with difficulty from others. When air does escape from the mediastinum it may follow one of three paths: (1) into the subcutaneous and deep tissues of the neck (2) through the diaphragm about the ribs and the esophagus to the retroperitoneal tissues and (3) into the pleural cavities.

A small amount of air in the mediastinum may produce only trivial symptoms and is not at all large amounts may cause a very grave disturbance leading to death. The effects of increased mediastinal pressure are similar to those of increased intracardiac pressure. As the pressure rises the heart collapses, the flow of blood into the heart is hindered and if the pressure is sufficiently high the circulation of the blood comes to a standstill. As the circulation becomes impaired dyspnea and cyanosis appear and later pulmonary edema develops to aggravate these symptoms.

The signs of mediastinal emphysema are: (1) physical signs: (a) subcutaneous and retroperitoneal emphysema; (b) obliteration of cardiac dullness; (c) peculiar sound heard over the heart; (d) evidence of increased mediastinal pressure—dyspnea, cyanosis, engorgement of the neck veins and dilatation of the jugular veins; and (2) roentgenographic evidence of air in the mediastinum.

A small amount of air in the mediastinum is so common that it requires no treatment. When pressure symptoms appear however it becomes imperative to furnish relief for the trapped air. The relief can be attained by mechanical means, by decompression or by some simple method. An associated tension pneumothorax should be definitely treated by free evacuation of the pleural cavity by the constant negative pleural pressure.

This may be done by introducing a needle into the pleural cavity through the chest wall and connecting it to a piece of tubing through which the air is sucked into a bottle of water.

SAMUEL KARY, M.D.

MISCELLANEOUS

Barrett N. R. D. B. M. D. W. G. Som. L. al. Th. rac. Tumors. B. J. S. G. 1945 3 447

The thoracic esophagus is partly because it is situated in the posterior part of the chest cavity and partly because the lesser thoracic esophagus is partly described as usual.

A man aged thirty six was admitted to the hospital because of increasing dyspnea on exertion over a period of six months. He also complained of intermittent epistaxis behind the lower end of the sternum but there was nothing to suggest pressure in the anginal type. Roentgenographs of the chest revealed an opacity about the size of an orange situated in the right chest at the level of the angle between the right border of the heart and the dome of the diaphragm. The mass lay in the extreme front of the chest immediately behind the sternum. The bronchial tree as shown to be normal by bronchoscopy and bronchograms and the diaphragm was not paralyzed. The electrocardiogram was normal and the possibility of a diaphragmatic hernia (through the foramen of the internal mammary artery) was not great because roentgenographs of the stomach showed no pathology. Operation was divided into two to which the mass could be held to explain the man's symptoms: whether the symptoms came from the mediastinum or the pleura of the lung. The pleural diaphragm

Artificial pneumothorax was settled as a question of this type by showing that the lung retracted with or without the mass and in the case of cysts as may occur in connection with the parietal pleura that the utility of the mass alters after it has been introduced into the pleural cavity. This method of investigation is not very satisfactory when the opacity lies adjacent to the mediastinum because the lungs are attached to the central structures by the pulmonary ligament and it may be considered a mediastinal tumor even if adhesions are not present. Artificial pneumothorax can sometimes be successfully combined with pneumoperitoneum and thoracocentesis purposes of diagnosis. An artificial pneumothorax was induced in this case but the additional light upon the diagnosis upon the point of origin of the mass. The acidity was positive and the right pleural cavity was opened by a short incision. The mass was immediately located lying transplanarily in front of the pericardium in the posterior wall of the main stem of the trachea. It was a thin-walled translucent cyst which contained a watery fluid. The cyst was removed with difficulty and the chest was closed. At the operation the pericardium was aspirated from the pleural cavity so that the pneumothorax remained. Convalescence was eventful. Such cases are usually followed by a modified cysts and at the time of the mediastinal tumor.

A girl aged eight and a half years old was admitted to the hospital because of a cough and intermittent epistaxis. The films showed a small opacity in the right lower lobe. A bronchogram showed a block of the right main bronchus at the level of the aortic arch. The bronchoscopy showed a tumor at the level of the aortic arch. The tumor was a small size of the tip of the finger. The tumor was removed by vulsion with forceps. The histological

examination established the diagnosis of a adenoma of the bronchus. The child made a rapid convalescence but the signs of ectasia of the lower middle lobe persisted. The question arose as to whether further treatment for the adenoma was desirable or necessary. The alternative procedures were considered. Conservative treatment was discarded because it was assumed that although bronchoscopy was negative at the time there was a tendency to be an intrabronchial extension of the neoplasm and this if ignored would sooner or later grow to a dangerous tumor. The second suggestion was to insert a needle into the bronchus but this also was considered dangerous because of the known tendency of temporary inflection of the growth of these cases and in the particular patient the extent of the lesion was doubtful and the placing of the needle would increase the possibility of an accurate. The third possibility was to do a lobectomy. Pneumectomy. Pneumectomy was preferred because it was believed that the extrabronchial extension probably lay in the angle between the pleural bronchus and the descending bronchus. The cause of the lower adenoma was the right lung were known to be infected and bronchiectatic. Convalescence was eventful and the child made a rapid and complete recovery.

This case was presented for two reasons. The first is the importance of finding the great majority of bronchial adenomas have a intrabronchial part and that this part may be taken to consider the whole of the tumor is planned. The second reason is that the average age of onset of symptom cases of adenoma of the bronchus is twenty-eight years and this patient was only eight years old.

The second case is of the bronchus presented because of certain features which are of special interest.

The explanation of the current condition of atelectasis and reexpansion of the lower middle lobe was that they were partially due to the blockage of the main bronchus by the growing tip of the tumor and partially to the fact that the tumor became necrotic and the fluid was reabsorbed. The latter is the bronchus. Thus the case is unusual because of the time when the lung was atelectatic at the time of the upper adenoma. It is believed that the condition is a domestic one only the upper adenoma is fatal.

The third case was a test case of adenoma of the bronchus. The fact that a bronchial adenoma had been diagnosed from the material secured at bronchoscopy might have been a satisfactory result if it had been noted by the physician that the adenoma was a small size of the tip of the finger. The tumor was removed by vulsion with forceps. The histological examination showed that the tumor was a small size of the tip of the finger. The tumor was removed by vulsion with forceps. The histological

loss averaged 20 cc and following operation the blood count consistently was elevated 500,000 cells with a corresponding increase in hematocrit and hemoglobin.

In the second group 8 dogs were subjected to lobectomy of the right lower and accessory lobes which was followed by a transfusion of 15 cc of citrated whole blood per kilogram of body weight. Approximately one month later the left lower lobe was resected and a similar transfusion given. The stage of lobectomy was well tolerated. One dog died 4 days after the second stage of extensive mediastinal and subcutaneous empyema. Two dogs died of terminal disease two days after operation and of terminal cause. Transfusions were given in from even to twenty six minutes and were not followed by pulmonary edema. As in blood counts similar to that in the first group was seen.

The dog (group 3) was submitted to lobectomy of the right lower and accessory and the left lower lobes at once and then transfused with 30 cc per kilogram of citrated whole blood. Six of the dogs were transfused in ten minutes (in from three to ten minutes) and the other 6 in from three to six minutes. Of these seven to ten minutes group 4 died in from two days to two weeks of various causes, but none developed pulmonary edema. Macroscopic section showed congestion of the pulmonary vessels but no edema. The results were similar in the blood counts occasionally as much as 1,000,000 red blood cells. Five of the 6 dogs in the group which were transfused in from three to six minutes developed pulmonary edema and died in one or two days. At autopsy the trachea was full of bloody frothy and blood tinged fluid escaped from the cut surfaces of the heavy soggy red lungs. Macroscopic sections revealed extensive edema fluid in the interlobular spaces.

In the fourth group the operation and transfusion were carried out as in group 3 with the addition of blood. Six dogs were bled 25 cc per kilogram of body weight (50 cc, less than the amount of the transfusion). The bleeding was carried out through the femoral artery while a transfusion was running to the femoral vein. The plan of this experiment was to avoid overtransfusion. The author believed that the blood loss in bilateral lobectomy probably was about 50 cc. Of the first 6 dogs (group A) 1 developed pulmonary edema and of group B 2 dogs developed pulmonary edema. All transfusions were given in less than ten minutes. The authors believe that the dog and transfusion here tended to simulate the blood loss and replacement.

One must vividly apply data obtained from dog experimentation to human clinical practice. In addition to the basic physiological differences between dogs and human beings certain conditions peculiar to this experiment must be considered. These factors must be kept in mind in interpreting the findings.

1. Blood loss in dog surgery is minimal compared to hemorrhage in similar operations in patients. All animals except those in group 4 were well transfused.

2. These experiments are unusually rigorous. Clinically bilateral lung resection is done at staged operations at monthly intervals. The amounts of blood used here were not excessive but were given in a very short time.

3. The remaining lobes in dogs are normal. Hence frequently in clinical suppuration and sepsis of the lung the upper lobes may contain residual abscesses.

4. We have no accurate measurement of the degree of any edema that developed in the animals that survived.

Gibson has shown that animals subjected to lung resection do not tolerate large transfusion as well as do normal animals. The threshold for that addition to the amount of lung resected therefore factors are present.

Obviously the amount of blood given will determine whether edema develops.

2. The time of transfusion is extremely important at least experimentally. Clinically this may not be important since blood is given considerably slower in most instances.

3. Overtransfusion tends to promote edema. If a transfusion no matter how large is given to replace hemorrhage in a reasonable period of time or simultaneously with the hemorrhage pulmonary edema probably not occur except in the presence of preexisting cardiovascular or pulmonary disease.

When a patient's status is severe hemorrhage in actual practice blood may not be available for immediate replacement. Then large amounts of saline or glucose solution in plasma are administered until blood is obtained. If no intravenous therapy is given the plasma is lost and the fluid enters the blood stream. Then a few hours later blood is given in the amount of the hemorrhage and the circulatory system is overloaded. The heart may fail and edema of the lungs occurs. It is not a matter of how much blood is given because any fluid in sufficient amount will overload the heart. However if large amounts of blood's constituents are given over a continuous period the volume of blood given

R. E. R. B. E. L. W. M. D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Rigle, L. G. K. plan H. S. and Fink, D. L. Per-
nicious Anemia and Tumors of the Stomach
J Am M A 3 945: 546

Many efforts have been directed toward an early recognition of carcinoma of the stomach. Even with the assistance of methods of roentgen diagnosis a more general use of gastroscopy, more extensive methods of examination of the gastric contents and stool, the summation of results is difficult. The salvage of but 2 per cent of the patients afflicted with this disease is evident in the survival of 6 per cent the maximum reported gives some idea of the difficulties involved.

The incidence of gastric carcinoma and the absence of striking symptoms even in advanced tumor are some of the difficulties to be surmounted in establishing the diagnosis. Roentgen examination is generally considered the most accurate procedure yet the diagnosis of malignant tumors is frequently overlooked. In support of this view the authors cite a post-mortem of the stomach of a patient with pernicious anemia demonstrating a benign polyp 4 mm in diameter. The lesion was not seen on first roentgen examination but was found gastroscopically and then demonstrated on re-examination. In all probability many such lesions are missed.

In an effort to test the accuracy of the roentgen method in symptomless individuals it was deemed reasonable to examine a selected group of persons in whom the incidence would likely be higher than in a group of persons selected at random. The authors selected a group with pernicious anemia since a review of the literature seemed to indicate that these patients would offer the most productive results. Accordingly in 1939 they undertook the roentgenological examination of 11 patients with pernicious anemia atemann interval.

The coexistence of pernicious anemia and carcinoma of the stomach has been studied previously since it was first observed by Quincke in 1861. Numerous reports have appeared as well as studies of clinical cases and a few autopsies. The association of pernicious anemia with carcinoma seems to be a well established fact but there is a difference of opinion as to its frequency. An increase in the coexistence of the two diseases is evident and is best illustrated by the various reports from the Mayo Clinic during the last twenty years. These trends may be divided into two better recognized gastric tumors but may also be divided into increased frequency of patients with pernicious anemia resulting from the institution of lithium therapy. In all the case reports there is a variable period of time following the onset of gastric tumor is diagnosed, the time after (as long as a century) or immediately with the discovery of pernicious anemia.

The data presented in a large number of studies indicate that an etiological rather than an accidental relationship exists between pernicious anemia and tumors of the stomach. Most investigators have concluded that there is a common precursor of the two diseases. The studies point to a hereditary or familial deficiency which predisposes to both diseases.

Another phase of the problem deserves special attention namely the relationship between polyps of the stomach to pernicious anemia and carcinoma of the stomach. The authors investigated both and that benign polyps are common regardless of the carcinoma in patients with pernicious anemia. Little doubt exists that many benign epithelial tumors of the stomach may develop into cancer. The evidence of the discovery of polyps of the stomach has greatly enhanced the effort to effect a reduction in the number of cases of carcinoma of the stomach. The degree of condensation of the distal end of the stomach is a possibility for the malignant degeneration of a polyp must be particularly borne in mind in cases of pernicious anemia because of the tendency of the latter to develop carcinoma.

The present report contains a roentgen study of patients with pernicious anemia. Roentgen examinations of the stomach with barium meal were made. In approximately 20 per cent only examination was made usually at the time the anemia was discovered. In the remaining 80 per cent multiple examinations were made usually semi-annually. Painstaking efforts were made to detect not only carcinoma but also benign polyps.

Thirty patients of the diagnosis of pernicious anemia was established in these cases by blood means, bone marrow studies, the presence of glossitis, the findings of bacitracin blood cultures, and a hemorrhagic anemia after hematemesis and the clinical hematological response to iron therapy. Gastroscopic examination was made in many of these patients and all of them the gastric contents and tools were carefully studied. Almost all of the reports of carcinoma were confirmed by surgery or by autopsy. Many of the benign tumor cases were likewise confirmed. The results of the study showed that carcinoma was found in 8 per cent (7 patients) and benign polyps in 71 per cent (5 patients) of the cases.

In an autopsy report of Lewin and others 23 per cent of the patients with pernicious anemia were found to have carcinoma of the stomach.

Outstanding features which characterize the findings in this series are (1) the rapid change in benign polyps to cancer (2) the presence of both benign and malignant tumors (3) the absence of symptoms in the presence of late tumors and (4) the development of a small

operation completely protected the dogs against the development of experimentally induced ulcer. It is clearly indicated by clinical and the experimental evidence that a short afferent loop contributes to the protection provided by the operation. Thus, ten of the quarter resection with a short loop as a stoma would appear to be the most satisfactory procedure.

Group 4a. The Finsterer antral exclusion with excision of the antral mucosa was found to be as acceptable as the three quarter resection. This procedure is of value in dealing with so-called inoperable duodenal ulcer and varies from the extensive resection only in the technique of maintaining the distal stump.

Group 4. The Finsterer antral exclusion without excision of the antral mucosa protected 4 dogs against ulcer but erisins in the gastric pouch were more numerous than in Group 3 and 4a. Operations. Although the experimental evidence is not conclusive, clinical evidence indicates that this procedure would be abandoned in favor of the Group 3 and 4a operations.

Group 5. Atral resection on plus total intragastric gavage. The Schminsky procedure was found to be operation rather than to protect against the development of jejunal ulcer and is to be condemned.

Group 6. Fundus my with gastric jejunotomy appeared to furnish satisfactory protection against the development of jejunal ulcer in dogs. Clinically, however, the gastric capacity is less adequate than that following the Group 3 and 4a procedure since the most distal portion of the stomach is removed.

Group 7. The operation in this series approximated Connell's original procedure and was done on 4 dogs. The procedure offers less protection than the procedure of the development of the developed duodenal ulceration and the others developed marked erosive gastritis. None of 5 patients in whom the operation was done became chlorhydric and symptoms from the ulcer continued in 2 of them. The principle of fundus my cannot compete favorably with the Group 3 and 4a procedure and the clinical indications for such a procedure would be much limited.

Group 8. Hemigastrectomy. It appears that this operation does not furnish adequate protection. An occasional ulcer which might develop following this procedure outweighs the importance of gastric function which might follow the more extensive resection.

Group 9 and 10. The exclusion and modified Denker exclusion with total intragastric gavage. These procedures proved unsatisfactory and are to be condemned.

Group 11. Simple resection of the gastric tomy. Although the experimental evidence is not conclusive, the clinical limitations of such an operation are obvious.

A member of the committee which is satisfactory operation must fulfill requirements which are difficult to meet. The production of gastric secretion must be accomplished—

this necessitates the sacrifice of an extensive part of gastric tissue including the antrum and lesser curvature. The manner of duodenal resection with or without removal of the ulcer is of no great consequence but the antral mucosa must be removed. Although the experimental evidence favoring the Edkins hypothesis of colic clinical experience indicates clearly the importance of the antral mucosa. The stoma is with the jejunum must be made so that the afferent loop is as short as possible. The short proximal loop is indicated by clinical evidence and by the physiology of the secretin factor and decreased tissue resistance to ulceration with a loop. Extensive three quarter resection including the antrum and distal part of the antral mucosa and anastomosis with a short jejunum. If the antral loop has been done clinically, a poor patient with ulcers is an instance of recurrent jejunal ulcer.

J. H. L. L. D. Q. T. M. D.

De Azevedo Sodre J. P. Tretemnto f f f f rat d Peptic Ulcers by Sec d ry G tract my (Tratam to das úl era pépt cas per f da pe ga tract mia ecu dári) Rev b as l i 944 J 15

In the emergency hospital in which the author has been of the surgical service 50 cases of perforated ulcer of the stomach have been treated. From August 1938 to August 1944. In these cases in all of which the ulcer had perforated into the peritoneal cavity a linear resection of the stomach in two places and covered with frame taken from the ed of the stomach. A pedicle of the stomach was transferred to the other side of the stomach in the upper part of the abdomen as free mobility is necessary to the normal function. In only cases of gastric resection and anastomosis was performed. In 4 cases must be diagnosed as appendicitis was made. Only 2 cases were drained. If the patient is recovered and died a mortality of 10 percent which is comparatively low with mortality statistics quoted from the literature. Brief histories are given of the cases in which death occurred.

Among these 40 patients with perforated stomach 13 returned later. The average hospital stay was 13.5 days. The ulcer was not put at rest by the progress of the ulcer. Although clinical diagnosis of perforated ulcer is difficult roentgen examination was most satisfactory and showed pneumoperitoneum. The perforation did not recur in 3 of the cases. Of the 3 patients that returned to the hospital 2 by gastric my and 1 by gastroenterostomy. The patient was given medical treatment. The patient with gastric tomy described a diet. The patient in the 13 cases. Roentgenograms photographs of the operation specimen and photographs of the histological findings are also given. The author believes that the mortality of the patient is indicated in the treatment of perforated peptic

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ADD BY G MORG MD

Fraser K. Malignant Tum f th Small Int
tl B I J S g 945 3 47

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operati mortality w s 50 pe cent a d for tho e f
sarcoma it was 75 pe cent

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JO F K NA MD

Crymbl P T UI f th Sec d P rt of th
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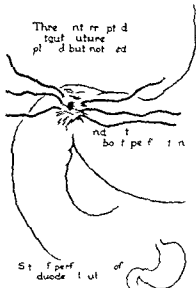
Graham R R a d T E B Th Tr tm nt
of P r f rated Duod n l Ul e S ger 945
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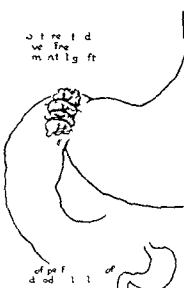
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J m n E M d Hoey W O P toperati e
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Primary j l ms f th intest e ar tr mely
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reoperation. Colonic irrigations are not necessary because the drug has the property of distending the content of the intestine and acting practically empty. The admittance of oil-sulfathiazole makes the use of various sponges unnecessary in colon to colon anastomosis. S. M. KAIN, MD

Pick R. M. Jr. Surgical Treatment of Congenital Megacolon. *J. Am. Med. Ass.* 1945; 128: 43

Congenital megacolon is an uncommon little understood condition which has challenged the medical profession since Hippocrates reported it. Little is known of the etiology of this disease and hence any plan of treatment becomes at once vulnerable to adverse criticism. Nevertheless, some plan of management is desirable and may possibly be useful even though it is necessarily tentative. The literature on the subject is confusing and difficult to evaluate. Many articles consist of isolated case reports describing treatment but they show follow-ups of only a few months.

In the present article the author attempts to correlate his experience with management of cases of congenital megacolon with the results of treatment of this disease in the hands of others. No reports of single cases have been included. The results in patients on whom full bowel sympathectomy was performed by the surgical staff at Tulane University School of Medicine and the Ochsner Clinic have been compared with results following this and other types of therapy previously reported.

In conjunction with this study a careful survey of the records of two large general hospitals in New Orleans was made covering the period of fifteen years. All cases in which diagnosis of megacolon or questionable megacolon appeared were carefully reviewed. About 30 such cases were found. In most instances the diagnosis was not established although the case was frequently roentgenographically evidenced by colodilatation and the clinical findings were sufficient to confirm it. Usually a few days of conservative treatment in the hospital sufficed. The subsequent course of the patients is not known. It is significant however that there were only one reoperation, one death, and one referral to another hospital for similar replacement. From this the author infers that mild forms of the disease exist which require special treatment only because of unusual impact on course.

The condition of these patients treated by symptomatic measures is definitely upper than the diagnosis of congenital megacolon is a firm one. The patient was performed for any doubt as to the nature of the disease existed if the medical treatment failed.

A nation both as a symptom and a sign, the condition of the intestine is met with the severe forms of megacolon. This was indicated in the patients treated by the author. In spite of the fact that no need of dilatation of the sigmoid with the rectum or sigmoid was found in the length of the intestine. The abdominal findings of the descending colon and sigmoid

or rectum was not different from the findings of the roentgenographic studies showed the undilated colon to have a normal ability to expel material from its lumen. The removal of the spastic colon was affected. Massive dilatation of the terminal ileum developed later. Many writers confirm the indications regarding the site and extent of involvement. These varied clinical types of megacolon do not but have caused considerable confusion in evaluation of methods of treatment.

The diagnosis must be carefully established by adequate observation and study of the patient. Medical management utilizing the sympathetic stimulants is recommended for a trial of from eight to ten weeks. Results with mecholyl have been disappointing. However, the results of Benfected effects have been better reported with the use of syntropin, an atropine-like drug which acts as a parasympathetic paralytic. Both of these compounds have opposite effects since both go to the extent of supporting the often-passed content in that part of the autonomic system; the fundamental fault.

Drug therapy must be accompanied by a careful regimen and bowel function particularly in the first months of treatment. A therapeutic test with atropine, spinal anesthesia, and catheterization in each case. The results of catheterization that the therapeutic test is extremely valuable. Spinal anesthesia is definitely known to have beneficial effects which in the present study sometimes. Anesthesia obtained in this manner usually results in a large bowel evacuation sometimes several such evacuations with the following interval of four hours. These results would indicate that the patients are sensitive and the effect regarded as a good reaction particularly if sympathectomy is considered. While the present study of information does not warrant a definite conclusion on the failure of spinal anesthesia to effect spontaneous evacuation, it probably closely associated with failures in surgical intervention. DeTours who has made a exhaustive study of case of congenital megacolon is of the opinion that an atrophic bowel wall is present in the proper anatomical sites should determine this factor. He indicates the use of a barium enema followed by the injection of a spinal anesthetic or acetaminophol. Five minutes later a film should be made to determine the extent of the evacuation. DeTours believes that the use of the drug, as evidenced from a spinal anesthetic especially for debilitated patients. The author believes that the subject patient less than two days of life years of age any surgical procedure unless it is a life saving measure. Conservative management with the high temperature saturation is the treatment of choice in infants.

If the medical regimen does not produce a satisfactory change, there has been a check of the sympathectomy should be considered especially if final anesthesia produces a copious bowel evacuation. Left lumbar sympathectomy is the simplest

In the differential diagnosis of acute appendicitis in children, it must adequately exclude gastroenteritis, constipation, tuberculous mesenteric adenitis, acute pyelitis, pharyngitis, bronchopneumonia, diphtheria, peritonitis. Rarely, acute rheumatism, fever, acute polymyositis, diabetic coma, and synovitis. If the history may be confusing. In babies and young children, intransigent and the symptoms of acute otitis media may occasionally be mistaken for appendicitis.

The treatment of acute unruptured appendicitis in children by immediate appendectomy is the procedure followed by Delaney, Peraton, and Ochsner. In tonsillectomy, the tonsils are removed before a local abscess can be formed in a prohibitively high percentage of cases in childhood. Conversely, if early operation is employed for children with appendicitis, the tonsils without adequate cooperation of the parent on many unnecessary deaths occur from tetanemia.

Serum dehydration and ketosis are common even in children with early appendicitis. Preoperative intravenous administration of dextrose and sodium chloride solution is usually indicated by the physician. The severely ill child with peritonitis and stunted growth should be given the fluids of plasma as well as of dextrose and saline solution. Sodium sulfadiazine is given parenterally in initial doses of 0.3 gm (0.3 gm) per pound (5 kg) of body weight. Fluids are given by constant gastric suction by the Wagstaff method. Morphine in three to four doses of high concentration (95 per cent) is given by the therapeutic regimen.

The decision to operate properly in these cases should be based upon the response of the patient to the therapy. Improvement, hemolysis, calistasis, decreased body temperature, and a fall in the temperature are important factors in the decision to operate. A decrease in pulse rate with improvement in quality.

The appendix is removed at the initial operation in 47 cases (93 per cent) while in 34 cases (7 per cent) it is deemed advisable to do more than a simple appendectomy. Of the latter cases, 3 were later admitted for interval appendectomy.

The choice of incision for appendectomy in children depends on the size of the child, the type of appendicitis. Because of the small size of the child, the incision is made in the line of the semilunar line, the anteroposterior incision in young children. The McBurney incision may be adequate for the posterior part of the appendix. The author rests this decision largely on the child's weight, the type of appendix, and the abdominal quadrant or with retrocecal appendicitis, and uses it as a means of trepanning the drainage of an appendiceal abscess. The right iliac fossa is the site of the exposure of the appendix in children with minimum retraction. Retraction of the rectum is a possible factor in the splitting of the belly of the muscle, since it ensures a stronger wound. As medial

retraction easily damages the nerve supply of the muscle, the author has recently employed lateral retraction almost exclusively.

The authors believe that drainage of the pelvis is distinctly useful in children with peritonitis. Appendicectomy is used. He uses soft pliable rubber drainage with the use of gauze (Penros). The drainage is always led down into the pelvis along its lateral wall and should never be placed among loops of bowel or against the appendiceal stump.

Intraoperative administration of sulfadiazine was used in 72 appendectomies for perforated appendicitis, abscess, or peritonitis. In 67 of these cases a drainage tube was also employed. Sulfadiazine was used in 50 cases of sulfanilamide, 17 in sulfathiazole, and 15 in sulfathiazole. The authors think that the trapezoidal use of sulfonamide compounds offered a great advantage over the oral or parenteral use of sulfathiazole or sulfadiazine, reducing the incidence of these complications.

The importance of a well-planned postoperative regimen for children with appendicitis is stressed. It is emphasized. Both major and minor incisions with their inherent danger of infection, peritonitis, sepsis, and subsequent sequestration should rarely be used. Precaution must be observed to avoid overload of the child with the necessary saline solution. Repeated small transfusions of fresh whole blood are helpful for critically ill children with peritonitis. If suction drainage is necessary, intravenous fluids are necessary for more than twenty-four days. But the use of amino acids should be indicated for the parenteral feeding regimen.

Chemotherapy was administered postoperatively. Sulfadiazine was used in 82 cases as a sulfadiazine. Both drugs seemed effective in diminishing postoperative toxicity, shortening convalescence, and reducing complications, but severe reactions to the drug resulted with sulfadiazine.

There were 8 deaths in this series of 506 cases, an overall mortality rate of 1.58 per cent.

J. PHILIP K. NARAYAN, M.D.

B. G. L. W. R. and B. G. L. E. C. St. Olaf of the
Sigmoid in the N. W. R. M. / 11 045
S. 455

An infant was operated upon fifty-two hours after birth for congenital stenosis of the first part of the sigmoid. A colostomy was done above the obstruction. A small catheter inserted into the proximal end of the bowel. Following this, the old McBurney method of anastomosis with necrotic pressure of a rubber band was done and finally when the baby was five days old, half of the sigmoid was removed.

From this experience in a patient, the author concludes that a pyloric colostomy in this type of case seems to be good practice. If there was a quiet mobility of the bowel, he would use the McBurney rubber band, necrotic colocolostomy at the original operation. SAMUEL J. FOGELSON, M.D.

try absorb on. A slight increase in the diameter of the hose might have reduced the amount of the effluent in the author's cases.

In 5 cases of reducible rectal prolapse in women the procedure has been safe and the results in 4 cases have been good for periods varying from almost 2 to 6 years. The fifth case of prolapse has twice recurred after twelve and eighteen months respectively of temporary cure. It appears that there will be a unauditable percentage of recurrent rectal prolapse.

JOHN L. L. BOGUE, M.D.

LIVER GALL BLADDER PANCREAS AND SPLEEN

Titlb m M Curtis A C a d Goldh m
S M Th Comparat e Valu f Sev Ill
F t n T ts A I t M 1945 653

Eightfold the functional reserve for most of the material the amount on each of 53 patients with various types of obstructed liver drainage was compared with the normal value for the normal liver.

The normal liver is the functional reserve for most of the material the amount on each of 53 patients with various types of obstructed liver drainage was compared with the normal value for the normal liver. The normal liver is the functional reserve for most of the material the amount on each of 53 patients with various types of obstructed liver drainage was compared with the normal value for the normal liver.

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them the production of bile pigment from blood structures greater than the liver can excrete. In obstructive jaundice the characteristic color occurs promptly upon the addition of the azo reagent to the blood serum (direct reaction) whereas in hemolytic jaundice the color appeared only after alcohol was added (indirect action). The biphasic or delayed direct reaction indicates both free and protein-bound bilirubin in the blood stream and suggests both obstructive and the large bile ducts or small intrahepatic channels and reduced cellular activity of the liver. The Lande-Bergh reaction is of greater value in determining the amount of jaundice than in stimulating the presence of severity of liver disease. A extensive impairment of liver function may exist with jaundice and severe jaundice may exist without liver damage. Among 58 cases of hepatic neoplasms and cholestasis the reaction was positive in 51.7 per cent.

Glucose tolerance test. Galactose has been chosen as a substance material with carbohydrate function of the liver because the renal threshold for it is high and the endocrine glands have no effect on metabolism and it is not utilized by tissues other than the liver. Forty grams of powder d-glucose given orally during specimens are collected at half hourly intervals for six hours. Water may be taken freely during the period. The 500 cc of sugar re the pooled and the amount of sugar determined by the quantitative Benedict's method. From the calculated the amount of glucose in the urine. A total elimination of 3 gm or more of galactose is an indication of liver disease. The test is least satisfactory in determining whether or not liver disease exists. It may also be used to differentiate a diffuse cellular intrahepatic lesion from other types in which cholestasis is not an intrinsic obstruction. In patients with cholelithiasis the test may be valuable in the diagnosis. When jaundice is due to hepatic disease a positive test is proof of cellular damage. The test was positive in 20.4 per cent of 54 patients with cholelithiasis. The test is not valuable in determining the presence or absence of liver disease. It is more likely to be positive in diffuse cellular disease (hepatitis) with jaundice than in the forms of intrahepatic disease.

Glucose tolerance test. Bicausine is the major factor in the liver is the conversion of glucose to glycogen and the storing the latter hepatic disease may in many instances produce a disturbance in glycogen metabolism. Withdam glucose to the storage of glycogen may be considerably impaired and when excessive carbohydrate is given it accumulates in the blood stream and is excreted by the kidneys. The presence of a high blood sugar titer is the product of insulin and the increased metabolism of glucose is due to the loss of the high blood sugar may result in a hypoglycemic reaction during the third fourth fifth hour after a high carbohydrate meal.

The standard method was employed with 75 gm of glucose per kilogram of body weight. The glucose

tolerance bnormal 0.4 per cent of 54 patients. If the test begins with a normal result, following the procedure which net a drug the first or second hours to a level higher than normal and then falls to a level comparable with the third or fourth hour, it is probably not due to the drug. The glucose tolerance test is a much more delicate test. It is used in the diagnosis of diabetes mellitus. The test is performed by giving the patient a glucose load, then measuring the blood glucose level at intervals of 1, 2, 3, 4, and 5 hours. The normal response is a rise in blood glucose level to a peak of 160-200 mg/dl at 1 hour, followed by a gradual decline to the normal level of 80-120 mg/dl by 5 hours. A normal response is a rise in blood glucose level to a peak of 160-200 mg/dl at 1 hour, followed by a gradual decline to the normal level of 80-120 mg/dl by 5 hours.

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At present the gall bladder and biliary tract were free of any inflammatory process but a large

abscess of the body of the pancreas as found which was necrotic and drained. The quadrilateral bed of the liver on the inferior surface between the falciform ligament and the gall bladder was bulging and pulsating, aspirated from this lobe of the liver. The lobe was incised and two abscess cavities were found and drained.

The postoperative course was satisfactory and the patient had not developed diabetes mellitus three months postoperatively. The authors interpret the suppurative pancreatitis as secondary to a acute hemorrhagic pancreatitis. The hepatic abscess they believe was probably due to bacterial invasion of the splenic vein.

E. R. O'LEARY, M.D.

Whipple A. O. P. necroticoduodenectomy for Islet
Carcinoma. A. S. 945 847

The author reports the first recorded on-stage removal of the head of the pancreas and duodenum with occlusion of the pancreas. This operation was

performed March 6, 1941, for an islet-cell carcinoma of the head of the pancreas. The patient has survived five years without evidence of recurrence of the tumor.

The author favors the one-stage procedure over his earlier two-stage procedure reported in 1935. He has followed the following two steps of the advanced stage.

1. The implanting of the common duct into the jejunum, and the duodenum to end-to-side according to the character of the loop or Roux type of jejunojejunostomy. This avoids the danger of a cholecystoenterostomy and the serious complication of a biliary fistula as a result of the cutting through of the ligament in the ligated common duct.

2. The implantation of the pancreatic duct into the jejunal loop below the choledochojunction stomach. This eliminates all the uncertainty and doubt regarding occlusion of the pancreas and possible fatty liver degeneration at

E. R. O'LEARY, M.D.

GYNECOLOGY

UTERUS

Jeff Oate T N A and Le r S Hypoplasia of the Uterus with Special Reference to Spasmodic Dysmenorrhea J Ob G B t Emps 1945 5 97

The authors present a critical analysis of hypoplasia of the uterus and its relation to spasmodic dysmenorrhea. This analysis is based on the case record of 89 patients completing a gynecological history. Only patients with a typical history of spasmodic pain are included. All cases in which associated lesions of the pelvic apparatus are excluded.

Of the 89 patients 43 were single and 38 married. One hundred and ninety-five women complained of sterility.

The onset of menstruation occurred within normal limits in most of the cases. Only 3 per cent of the patients had scanty menstruation and the average interval between menstruation in the group reviewed.

Most of the uteri measured 3 to 4 inches in length. Some type of abnormal development of the uterus was noted in 74 per cent of the cases. Anteflexion of the cervix was found in 368 cases, congenital ectocervix and retroversion in 5 cases, a congenital cervical ring without pouch in 39 cases. The authors conclude from these figures that it is the malformation rather than the degree of development which is the factor causing the dysmenorrhea.

The endometrial patterns were studied in only 3 cases. However, the authors stated that the findings supported the view that menstruation is characterized by a type of the uterine type.

In this series of 89 cases, 15 per cent of the patients had definite evidence of uterine hypoplasia, was found in only 15 cases, and it was questionable as to the incidence of 3.38 per cent.

A discussion of the therapy of hypoplasia of the uterus with estrogen is given.

In summary, the authors state that the spasmodic dysmenorrhea is related in some way to contractions of the uterus. The difference between painful and painless contractions lies in the character rather than in the strength. The theory that it is a disorder of the different areas of the uterus is disturbed polarity of the uterus to be the cause of pain during menstruation has all to be disproved. Also, the evidence is not at present enough evidence to prove or disprove the theory which proposes uterine hypoplasia to be the cause of the abnormal uterine contractions. H. A. FIELD, M.D.

Findl D End R Its in th Treatm nt f Cervi cti Am J Ob 1 94 49 6 4

Two hundred and forty cases of chronic cervicitis were treated by the three generally accepted methods.

of electrosurgery, namely, nasolip cautery, electrocoagulation and coagulation. The results of treatment and after healing was clinically complete.

Comparisons were made as to the type of healing following each therapy and measured as to result in complications. The average results of healing were the same with all three methods.

The percentage of satisfactory results as greatest after electrocoagulation, next greatest after nasolip cautery, and lastly following cauterization. There was a little difference between coagulation and cauterization in the number of complications. The number of complications was very low for the first two procedures but slightly greater following cauterization.

The complications which must be mentioned counter to the hemorrhage, the following complications: a dermal infection, the following complications: Hemorrhage usually occurring within the first five days after treatment, the following complications: Stenosis with resultant pyometra may be a complication of the procedure.

Carcinoma was discovered in 2 cases, one of which among the married. Internal temperature was elevated to interfere with proper healing. Their results were good.

EDWARD L. CORNELL, M.D.

EXTERNAL GENITALIA

Canberg B L Pstimen pauts I Pr It V I Am J Ob 1 945 49 647

The theory is advanced that most cases of postmenopausal pruritus vulvae are basically due to a local atrophy of the skin. This permits an action and infection of the vulva by the usual pathogenic skin germs which are always present in that region.

The result of inflammation of the nerve terminations in the papillae of the clitoris and perineum is the itching. The macroscopic and microscopic pictures are largely determined by the individuals' defense reactions. The same stimuli which will result in a clinical picture of one person will cause leucoplakia in another. The best method of obtaining relief is to protect the skin from any further irritation by the constant application of a bland ointment for at least three months.

An androgen ointment should be used locally in those cases which exhibit severe vulvitis.

The successful treatment of 4 cases of severe postmenopausal pruritus vulvae in which the therapy and post therapy vulvitis were obtained is reported. Five of the patients had leucoplakia of the vulva. EDWARD L. CORNELL, M.D.

S. K. W. Tilbury R. and Coll y J Gorrheal V Glutit J Am M A 195 5 593

The authors present their experiences with dose per cent treatment of the hemorrhoids.

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C REBERT B H MD

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

K G G a d R i d L T T i R e l t i n o f V i t m i n
B D e f i c i e n c y t o t h P e g n a n c y T m i a A
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t e n l f a t l t e s

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M a g m m n t f t h e p o r t o c o n v u l s i e t g h e h
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s t g w h c h i s t h a t p e o d b e t w e n t h p o s t e r n
u l e t a g a n d t h n s e t f l b o r r q e s l l t l e
d t n d l a r g q u n t i t e s o f f l j s b y m t h
B l o o d p r e s u r d e t e r m i n a t i o n s (r v f o u r h o r s)
q u l i t a t e d q t t t i u r i n a l y s e s d a i l y h m
t o c r i t d t r m n a t i n d r n a l f h p t c
f n e t n t e s t a r m a d T h e d a i l y f l d i n t k i
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d t o f 1 0 0 g m i g e n

I f t h e p a t i e n t g o o d c o n d i t i n d c l o s e t
t e m t h e c r e i n d c a t n f r r e a s o a b l y p m p t

On March 16 1942 the right kidney was exposed and a biopsy specimen obtained. Vascular sections from this tissue showed arterio- sclerosis of all the arteries and arterioles. There were however no necrotic areas and no demonstrably definite glomerular or tubular changes although there were some question regarding the tubular epithelium in certain areas. According to the descriptions of Castleman and Smith, the picture was that of moderately advanced renal vascular disease and was comparable to the grade.

After discharge from the hospital the woman only menstruated which began April 24 1942 and continued through August as found to be irregular to the size of betweens in duration and twelve weeks of pregnancy. At that time the only finding of importance as a blood pressure of 220/135. In view of the danger anticipated interruption of the pregnancy was advised but this was refused.

The pregnancy progressed uneventfully except for persistence of the hypertension and headaches until about the beginning of the thirtieth week. The total weight gained was 4 pounds. On November 14 1942 albuminuria was noted for the first time. This increased from a slight to a marked degree and many hyaline casts had appeared by November 18 although the systolic blood pressure remained around 200. After admission to the hospital on November 20 the ordinary and special tests were repeated with essentially normal results in most instances.

Headaches now became progressively worse until by the end of week the patient complained of almost constant pain in the head which was intense to greatly interfere with sleep. Vomiting also became frequent.

On November 28 1942 clinical examination was done under general anesthesia. The child weighed 4 pounds 1 ounce and was in good condition at birth but died of prematurity and atelectasis after forty-nine hours. Respiratory failure from the uraemic acidosis was the cause.

This case tends to confirm the previously debatable but yet commonly held clinical opinion that essential hypertension without kidney changes except for a possible leukotome functionally important with an implication of a renal cause. EDWARD L. C. TELL, M.D.

PURPERPERIUM AND ITS COMPLICATIONS

Fulton A. A. Puerperal and Latent Malignant in an Indian (Town B. I. M. J. 1945 693)

Cases of puerperal diphtheria in maternity in a midwifery unit of 4300 inhabitants. The data were studied in September 1941 and December 1943. The incidence was 1 per 1000 live births with 3 deaths.

The incidence of diphtheria during the period of observation was 4.7 per cent in the hospital and 37.3 per cent in the community. The most frequent diagnosis of this disease was diphtheria but also influenza.

and spontaneous vaccination on a case (an abstract). The incidence of mastitis as described was 8.9 per cent of the total number of deliveries. 6 per cent of the patients with mastitis were discharged in the hospital and 2.4 per cent were discharged at home. The highest incidence of mastitis occurred three or more weeks postpartum.

The interest points brought out in this study are as follows: (1) the high incidence of the complication as compared to the figures of other observers; (2) the high incidence among hospital deliveries than among home deliveries; (3) the occurrence of most of the cases as late as the second week postpartum.

The author gives as possible factors the high incidence of mastitis in cases of fulminating puerperal sepsis, long periods of time with postpartum fever, epidemic during the period of these studies, the high incidence of mastitis in hospital deliveries, concerned several factors mentioned.

1. The presence of microorganisms in the section; 2. carriers (patients staff and visitors) and in dust to which the newly delivered mother has not acquired an immunity.

The possibility that no error in diagnosis is due to the infant acquires microorganisms from a later transferred to the mother.

3. The tendency to error in diagnosis. 4. The high hospital rate in feedings with daily long intervals (usually 4 to 6 hours) between feedings which encourages stasis.

5. Malnutrition of the mother which favors the infection.

Treatment for the gravest cases of mastitis during the third week postpartum the author suggests breast prophylactic prophylaxis, however a series of the patient leaves the hospital in a satisfactory condition for the first three weeks postpartum. The tumor of the breast is accepted bilaterally.

HARVEY FIELDS, M.D.

MISCELLANEOUS

B. H. T. F. Cesarean Section in Oklahoma in 1943. B. I. J. S. 1945 53 39.

This study presents the percentage of cesarean deliveries in the five major hospitals of Oklahoma during the year 1943. Total of 104 delivered and 104 cesarean deliveries representing 4.0 per cent of the total number of deliveries are presented. The incidence of cesarean deliveries is 14 per cent in the five hospitals and 0.97 per cent in the state. All but 3 of the patients in this series were white.

The type of cesarean section for the mother and the fetus in the state is as follows: 1. The incidence of cesarean section for the mother is 14 per cent and for the fetus is 0.97 per cent. 2. The incidence of cesarean section for the mother is 14 per cent and for the fetus is 0.97 per cent. 3. The incidence of cesarean section for the mother is 14 per cent and for the fetus is 0.97 per cent.

I nearly 54 per cent of the women the p e g a c y was the first. In most of the multiparas the indication for operation was a previous cesarean section. However, accidental hemorrhage to the prelo s difficult labor and disproportion accounted for about 25 per cent of the indications the multiparas.

Of the 11 cases attended 58 per cent of the patients a d general practitioners attended 42 per cent.

The operation as elective in 56 per cent of the cases.

The low cervical operation as performed in 52.5 per cent of the cases and preferred in three of the five hospitals in the hospital the classical operation was the procedure of choice. In the low operation the transverse incision as made in the uterus approximately 6 per cent of the cases. In 9 cases the uterus was removed at the time of cesarean section.

Stilization was combined with cesarean section in 82 cases—by ligation of the tubes in 47 cases and by the method of Madler in 26 cases. In addition 9 patients sterilized as a result of the P r o peration. In 4 patients the only reason for peration was sterilization which is an justifiable procedure.

As to oxygen and oxygen the babies that in most cases. Spinal anesthesia used 7 times and local anesthesia 4 times.

Consultation before operation was obtained in only 3 per cent of the cases in spite of the fact that 42 per cent of the attendants were general practitioners.

The fetal mortality was 4.8 per cent. Perinatal mortality accounted for 4 fetal deaths the time of perinatal being ill-chosen. The other fetal death was due

to placenta previa or premature separation of the placenta. In 3 cases of abruption placenta in the latter group the deaths were certainly not preventable.

Since 64.5 per cent of the patients had no labor before cesarean section it is impossible to determine how many may not have needed abdominal delivery. It would seem that every patient should have a test of labor unless there is definite contraindication.

The indications for cesarean section were varied and many. Primary section had led the list of proportion and contracted pelvis came next. Maternal and bacterial reasons were given which indicated semitotal placenta previa accounted for 8 per cent of the indications to enter for 6.5 per cent and premature separation of the placenta for 5.5 per cent. Blood transfusion usually frequently in the bleeding cases. Convulsions occurred 2 times per cent. The two fetal deaths the term patients. As perinatal mortality was 4.8 per cent before operation.

There were 2 maternal deaths—one from toxemia and the other from hemorrhage associated with placenta previa. The second red a very good record. Whether the patients could have been saved by different treatment is open to question. The few deaths forms.

Operation table for both these cases the scarcity of maternal perinatal. Appendix my with cesarean section was performed in the case of myomectomy with cesarean section in the case excluding the 9 per cent of operations.

Asplasia of the complete hospital records. In many cases the indications for operation were not understandable from the records. Many cases of contracted pelvis had no gynecological support and a diagnosis.

aque of ureterocolic anastomosis is briefly discussed. Cley was the first to suggest that a valve-like mechanism preventing reflux of the feces into the ureters could be effected by allowing the ureter to be free to dilate in the submucosa before it entered into the lumen of the intestine.

Since delay in operation for exstrophy of the bladder is associated with a high mortality due to renal infection and resultant renal failure, operation is advised at an early age. Higgins reported on 19 infants 2 of the infants died and the remainder progressed satisfactorily.

The authors present reports on 3 patients in 2 of these children the first ureterogastrostomy was performed at the age of eight and one half weeks and ten weeks respectively. In each case the ureterostomy anastomosis was performed in two stages by the Stiles Mayo technique. This method is to cut the ureter obliquely at its lowest point. A catgut suture is passed through its point and tied the uine guid is threaded into the ureter. Though a small incision in one of the taenia coli the mucosa is punctured and the ureter is passed into the colon. The needle is brought out 3/4 inch lower down and the ureter is anchored by the catgut tie. The ureter is then buried in the wall of the intestine. The distance of 1/4 inches by two rows of Lambert sutures. Wound infection, pericystectomy was common.

The period of hospitalization after the primary operation averaged four months and plastic repair of the ventral hernia was postponed 6 weeks. The results were good. ERN E AR III M D

Fleming A I and O'Brien H A. The Female Urethra. *J Am Med Ass* 945 3 4 8

The authors call attention to a condition—prolary or gyniary posterior urethritis—where the vestibule is frequently overlooked. With reference to its etiology apparently little is known. Two groups of clinical symptoms bladder irritation and pain are discussed. The bladder irritation is characterized by frequency and burning which varies in severity and may occur in attacks or even continuously. The pain is added to the referred pain manifesting itself in different locations in the genital region. The pain is localized in the inner aspects of the thighs with inflammation in the inner aspects of the thighs. The urethra is usually free from pus.

The treatment advised consists in progressive catheterization of the urethra 3 to 32 F followed by fulguration of the pathological tissue in the posterior ethmoid. A report in the literature mentions that many cases are cured after a period of rest. The results are chronic endorhinitis may be a factor in the etiology. WILLIAM W SCOTT M D

Shlonsky H S, Racine L R and Bi-hoff L J. Female Genital Enlargement in the Army. *Report of the Central Study of 100 Cases*. *Am J Med Ch* 945 7 97

A clinical report on the study was made of 100 women with functional (cystic) ureters. Am

training camp in the United States. The educational and occupational background of the group was general below average. Most of the men had lived in rural communities and used outdoor toilets in childhood.

There was a high incidence of enuresis in the immature members of the soldiers' families (parents, siblings and children). A considerable number of men gave a history of disruption of the home or of exposure to various other unfavorable types of emotional environment in childhood. There was no definite evidence of mild or arrested forms of the degenerative disease (so-called myelodysplasia) in any of the series. Simulated enuresis could not be demonstrated in any of the group.

There was a relatively high percentage of men in the categories of below average intelligence (dull, normal, borderline and moron). The vast majority of them manifested in addition to enuresis various neurotic tendencies and personality disorders usually beginning in early childhood. Most of them showed evidence of emotional immaturity, dependence and a passive type of personality makeup. Not infrequently the enuresis was persistence or recurrence of some of the various so-called neurotic traits and habits disorders in childhood such as nightmarish, nail biting, stammering, fear, the dream sleepwalking and talking in sleep. Functional headache was a common symptom. Virtually none of the men had ever received adequate medical attention for the enuresis prior to their period of Army service.

Functioning enuresis in adults is generally but one manifestation of a life long pattern of neurotic behavior or personality maladjustment and is not frequently associated with adequate intelligence. Apart from the consideration that the symptom of enuresis itself creates a difficult situation in the service it appears that the general majority of the adults do not possess the emotional or intellectual qualifications necessary for the successful performance of duty in the armed forces.

JOHN A. LO M D

GENITAL ORGANS

Nicholson N F. Carcinoma of the Prostate in a Youth. *B J U S* 945 3 533

Nicholson reports the case of a boy fifteen years of age who developed symptoms of vesical neck obstruction and gyniary retention and required a suprapubic cystostomy.

At the time operation was performed a nodular aggy swelling the size of a tennis ball was found in the region of the prostate gland. The patient died the day after operation and section was taken through the prostate at autopsy revealed a typical cellular carcinoma.

According to the author this case represents the youngest patient yet reported with a carcinoma of the prostate. Gardner and Cummings in 1932 reported a similar case—a boy sixteen years of age. WILLIAM W SCOTT M D

MISCELLANEOUS

Roman ky M J Murphy R J and Rittman G
E Single Injecti n Treatm nt f G n r rhea
with P n rillin J 4m Jf 4 94 5 4 4

The auth rs su ceed d in pr l ging th ct on of
calcium penicill n by su pend n t in beeswax pe
nut oil

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pen cillin in bees a pe nut l Ther w re no f l
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of 5 000 un ts Ninety thee of th oo pat nt
wh recd sngle inj t on of 100 000 un ts we e
cured The m in n 7 who ece d 100 000 u ts
re n t be ented b t expended t a cond gle
i j ct on of 15 000 u ts of pen cilli in beesw
pe nut oil

A ngl i j ctio f f om 100 000 t 5 000 un ts
of calc m pen cilli n in beeswax pe n t oil will pro
duce a d m untain a s abl l l f pen cilli n n
th blood f e en and one half t t n h rs w th
the c c et o of penicill n c nt ung in the urine f r
from tw nt four to th tv tw h urs

The pen cilli n bees pe r l m ture has
prod ced n abn mal e ctions l cally constitu
t all

St king f tu es i the t e t m t f th pat ens
with pen cillin in bees ax pe ut il w re the rap d
d appe r nce u u ll ith n c n h rs of th

subject e mptom espec lly f equ c n l pa
on rinat n the rap d tv th whch th p rul t
d charge became mucod and d appe r l and th
ealy tta ment f bact ol g cal n g t t

Twent f r h rs f ll g the inj ct lght
or e t p ce ure was pres nt b t th s g n
within fort eght h rs In n e of th pat nt
this ries we ther an all rgem n festat t
the mixt e \ h t r f t t t p e t
was obta ed Jo ra K \ M D

J pson R P and Whitty C W M O S H
dl l Dy uria L t L d 945 4 751

In a series of 450 head w n l tr t l th h gh
s ll d az e d sage 7 ca es of dysu er
Th incident be rs a cl lat n t th ary
pH no case occur d th pH f v 6 5 \ th r
th total d sage le th f the a l m tr t n
appe rs to flect th d

The clin cal p cture i el cut i t s abd m
inal p w th lon te f es l an l blood
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Pr phyla is dep nd th c ntr l of th u ary
pH ad utp t f eatm nt by int n i l m n s
t at on of intravenous sll d ith alk l In ly 5
cases w ur te c c thet erizat n d n a d t w
necessary p ob bly o l in \ n f thes e c
was fatal, alth h p t e t d d f th
h rtly after th rys mptoms had cl a d

J v a Lo r M D

SURGERY OF THE BONES, JOINTS, MUSCLES TENDONS

CONDITIONS OF THE BONES JOINTS MUSCLES TENDONS ETC

Di ks D D Camp J D and Gh rml j R h
O t ill D f r m P g t s Di as f th
B e Rad l y 194 44 449

Th study a analys f d ta n 367 patients
s en at th Mayo Clinic p r t J uary 1938 fo
hom the had been a di g s s of o t t u s d for
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microscopic findings are included in the article
Geo. I. Reel MD

Steel leg M nd Skulllet 1 J Angi m f
M scl (A gi m m scl) Rev ori p t
mal B Al 1944 4 152

Six cases of muscle angiomas are described and illustrated with photographs and photomicrographs of the histological findings. The angiomas were in the lower limb and on the back. The angioma was in the forearm and in the nape of the neck. These tumors generally begin early in life. Three of the four patients were children.

These tumors occur most frequently in the muscles of the lower limbs. Davis and Kutlowsky collected 212 cases, 930 and Jenkins and Delany collected 256 in 1932. Weaver in his statistics on 37 cases found a definite genital origin in 13.4 per cent and a history of trauma in 21 per cent. There was a history of trauma in only 1 of the authors' cases.

Angiomas of muscle are generally benign but cases have been reported in which they undergo a malignant degeneration. This occurs in the majority of cases especially in the locomotor system and is probably due to pressure on nerve filaments; the degeneration is frequent. In 1 of the authors' cases there was irreducible equinus.

Generally the diagnosis is made on palpation but there are symptoms which indicate the diagnosis. Often there are many telangiectases of the skin the tumours generally begin in infancy or childhood and phleboliths can often be found on palpation. The pain and deformity are characteristic. Roentgen examination shows phleboliths.

The p n s s in gener l s good Wh th tumor
is lim ted t one t o muscles t ca b removed
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AUDREY G. M. M.D.

Bo tro T A Bl l A III nd Chlpm W
A N plnt g Tre tm t f Elbow J int
I J ries AR port f It U In 20 Case 4m J
S f 945 68 j

In only a series of a few minutes of the elbow, a temporary immobilization was possible.

d. In these 4 cases the period of immobilization averaged six and three fourths days. This average too high here because of another eight cases in which the mold was left on a inadvertently for thirteen days.

In the 12 cases in which the e was little or no displacement of the fragments non-plunging with the triangular sling was used exclusively with excellent results. In addition to these 12 cases 5 cases of Newirth's are cited.

In the 8 cases in which the fractures were more complete open reduction was necessary in 4 and temporary splint in 4. However the principles of early active and passive motion were employed in all of the cases with result in which the authors consider to be superior to those obtained by the older method. In 11 cases the actual function of the elbow joint was excellent and in all cases a triangular sling was used. Protraction and supination are the functions which return first. Flexion is next and extension returns last.

The nonsplicing method in fractures and epiphyseal injuries about the elbow joint with the placement of fragments has been found to be the method of choice.

In fractures requiring reduction occasional joint was desired for rather brief periods of time (usually 1 to 2 weeks).

It is recommended that the nonsplinting method of treatment of acute and injuries about the elbow joint be more widely employed and the results studied. However the authors caution against the indiscriminate use of the nonsplinting method in the complicated case requiring reduction.

ROBERT P. MONTGOMERY M.D.

Gray II Arach od ctyl (Spld r Fingers) A h
I I M 045 75 5

Arachnoid cysts of the posterior horn of the lateral ventricle are found in 11 of 100 cases of congenital hydrocephalus. The most common cause of the cyst is the dislocation of the choroid plexus. The cysts are usually filled with cerebrospinal fluid. The diagnosis is made by CT scan. The treatment is surgical removal of the cyst. In 100 cases of congenital hydrocephalus, 11 cases of arachnoid cysts were found. The diagnosis was made by CT scan. The treatment was surgical removal of the cyst. In 100 cases of congenital hydrocephalus, 11 cases of arachnoid cysts were found. The diagnosis was made by CT scan. The treatment was surgical removal of the cyst.

The author points out that the pattern and the procedure was followed in the description of this study. Therefore it was difficult for the reader to follow the findings and to use them for comparison. In this article an attempt is made to follow certain lines of comparison and outline by the author previous articles. One case is described in detail and the other three are only mentioned.

At e r o l d n f Dalmati m th r a d a
P t g u e s f t h r d s h n n o a t r m a l i t i e s a s t o
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FRACTURES AND DISLOCATIONS

Hilch y J J and Bick l W H Fracture f th
Atlas A S f 945 820

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appa t rary and th comp rativ ly fav rabi
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to 11 Th m r taly rat f o pe e t n the
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C l icals ns r sca ce 7 cases f isolated fract r
of th atlas O d n rly they co s t n p n and st fl
ness of th neck w th te deress esp call n th
suboccipital r a M tons are usually l mited and
slowly perf rmed although th e may be n tabi ty
which causes th pat ent to h ld h f ad with h
ha ds Occas onally th patient m y complain of
t npl g and pain; the rris nd le s desp t the ab
ence f neurol g cal find ngs S allow ing m y b
painful or mpa red b cause of ret ophary n l h m
o tha particularly i cases of fract e f the an t
r or arch Inv l ement f th grater cept l
nerve may i duce ne ral ver s area of dist l
but on Inj ry t a v stebral artery occurs m ra
ista ces

T r a t m t of fractures f th atlas h s b ome
fairly w ll ts dardized and good results ha e be n
btained with most of the m ans used F om 4 t o
pou ds (8 to 7 kgm) of he d tract on b d n
straigh ext ns on r sually s f f c i t for imm d
ate rel f f the symptoms altho gh occas orally
mo e re needed A Say e sling will s f ce f r this
R laxation of the neck m u cles q ickly obtai ed
and n a few days a plaste cast or le ther coll r
may be appl ed t imm b l e the neck Shoul f the
fractur be complicated by tendency t sublux te
the tract n m y ha e to be cont n ed f r three
four week befor the us f a coll r From s t o e
ht weeks after n complicated inj ry th pat n t
re-examined and n w roe tge o rams are taken
Th coll r is disca ded at n y t me fter fr m eight
weeks to four m nths a cord n to the progres f
the pat ent nd the roentg ograph c find e Aftr
removal of the collar ret m of fu t o is materially
aided by physical therap Stiffness d limited
mot on of the n ck re stubborn res dua of uch t
j ries Alth ough it m y quire some months ult m
te to ret n f fu ct n is lmost l ys compl t
When th cond t n is compl cated by greate
ccipital eural a how r persistent pai may r q
surg cal int rvent Lack of call s f m at on is
characterist d l yed incomple te ly occur
ring egul rly and non union occurs frequ ntly

In 3 cases the results were classed a xcell nt in
as good m as fair s d 7 i ca e as poor Ther
fracture s rely unit b t th re is ally n ult
mate disabi ty ltho h stiffness and l mted mo t
on of the eck may som times persist for 7
months

Goldenberg R R Closed M l pulati n fo the
Red t n of the Neck of th Radi In Chil
den J F S f 945 7

Th a t o d cr ves th P t t r s n m n pul t n
fo d ct on fractures f th neck f th rad i
chilren and tes 4 ca es n which t l ct r r
ults we l t n l b th metho d

In th P t t r s n m n pul t n th l w s
tended and th f e m p t l g l t t
t action manta l n th s p tell a m and
with firm l r al p e e a n s f the m l al h meral
c ad l th f r m f ce f r l all unt l th
ct rving angl is cre d th j ns th lot r l
j t space Th d plac d fragm t th n manu
ally r pl e d

Th m n pulat n p e f m d unl r g n r a l a
st h s a R d ct n com l t wh n the a t cul r
r f c f the rad s l cap t l l m ar par l l
en by means f x ys Th t m ty is imm l
lized in jast f th e w k with th llo w h ld
in ood g ees of fe n l th f r m in compl t
up nat n

In th 4 ca es t t l by th meth l c l l nt
results e e l t n d r l good ange f m t n a
s d Th th r r comm d th t th cu ev
atu e tr atm nt be t ed l m lar ca es b f r
s r g r y is und itak

Du TEL H Le Tnt L M D

ORTHOPEDICS IN GENERAL

Brainerd H Katz H J R w A P J d
Geig r J C P l lomy l t l s J Sm M A s
1945 1578

Intr w th th e ca d n l ympt mdes ib d
by Ken y namely muscle pa m t lal at n
and c ord nat the auth r r c r to th tnd gs
of M l d e Sch artz a d B ma a d W tk
Braz r and Schwab N r mu ula de e r t
w s p e s e n t n all mu cles d f l n t l
Mu l spa m a comple ph m n produ d by
th e e f ct r s (r) m g al r r m t () han d
str t h r e f c s of mu cles oppos d t m s les h b
it neur m ula deg rat a d (j) r n tati
les s f post n g lions and p e t e n r m e l l s
Acti cure t s ested spasm l m u cles
cept th e compl t ly pa ly l Cl l f m
was ft n t appat nt esp cially n w km cles
Incr ased action pot tial w r f l n th rest
tat l l m s les l l h th r i j a m r
n t e s p e c i l l y f th r m th r e r y p r o d
Thes r r s b e l d th t th s as d n e l
eco ery of i r v a t n Thes est gat r s h o
n ted s m u l t a cou t t cu r n t both f w
ppo m s cles pat t s e c l r r p o l o m
l t wh h p bly a u t d f th n co
ordi t n

Th ltho s p r t o ca es of ut e j l
myelitis att mpt r g t est mat th l eacy f cu
tgm h t f m tat s a d m u l r educati n
All a es h b b t e d p a m th f r m f h p e r
unr itable t r t h r f p r l l m t e d m m t

The muscles most frequently involved were the posterior cervical back and hamstring. While these are the muscle groups which irritability to stretch stimulation is commonly attributed to meningeal irritation, such is not the case in polyomyelitis since these symptoms often persist many months after all possibility of meningeal irritation has passed and also because the spinal fluid was found normal in a significant number of cases.

Muscle weakness was observed in 48 cases. Weak muscles often developed atrophy while under rest, at rest motor power generally returned gradually during re-education.

Inco-ordination was observed frequently, patients with weak quadriceps who on being asked to stand the knee would vibrantly contract the hamstrings.

Of 28 early cases in which one hour tests were done after the injection of stigmine 4 (85 per cent) showed a significant difference from the lax at rest. Measurements of impeded ranges of motion were made with the goniometer. Motor power was estimated by clinical examination.

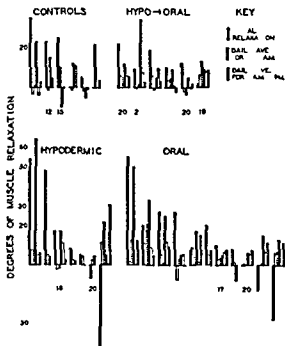
The authors concluded that the value of continued medication with neostigmine orally is still uncertain. The study gave promise for further proof but it is rather trial under controlled circumstances is definitely warranted.

The authors state that the Kenny treatment with or without neostigmine is an effective method for preventing contractures and deformities.

The study gave promise for further neostigmine. The Kenny packs reduced the incidence of paralysis. D. VIELH. L. VI. H. L. M. D.

Fox M. J. and Spanku W. H. Neostigmine in Polyomyelitis. *J. Am. M. Ass.* 1945, 87.

This study was based on the treatment of 24 cases of acute anterior poliomyelitis in patients from three to fifty-five years old. Neostigmine was given subcutaneously and orally. A total of 16 cases



NUMBERS BELOW EACH INDIVIDUAL PICTURE REPRESENT DURATION OF THERAPY

Chart Effect of cost of neostigmine on muscle relaxation. The chart shows the effect of neostigmine on muscle relaxation. The y-axis is 'DEGREES OF MUSCLE RELAXATION' and the x-axis is 'DAYS'. The chart shows that neostigmine has a significant effect on muscle relaxation, particularly in the early stages of treatment.

did not receive neostigmine. All of the cases were given Kenny treatment. The results apparently did not lead to definite conclusions but the authors thought that the combination of neostigmine and treatment resulted in a significant perceptible increase in the muscle spasm.

DAVID H. LEVINTHAL, M.D.

SURGERY OF THE BLOOD AND LAMP SYSTEMS

BLOOD VESSELS

Sell rs T H S r g r y f P rs t nt Ductu Ar
t rios L f Lo d 94 45 6 5

The author states that the first cases of the which a patent ductu rteri sus a clud d by surgery as record d 030 A number of s cces ful ca e ha e bee recorded nce that time S r gery can b ued ly thoe ca es f pat ncy i h ch th ocel s o ld not br about any d t m t to th rcul t ry t m It can be f gre t b efit t pate ts ha s s f rring from l l e ffe ts att butabl to the abnormal t and i mu t be de l d hat crum tances a d compl cat con st tut n i d c t o for terfe e c

A pere t nt ductu n art rove o f tula thr u h h ch the p lmo ary and system c rcul t c n c me i c n t a t The d r c t o of any blood stream thr ough the ductus f om th h gh p e r f th rta int the lo e t n f the pulm nary c culati n with the res lt that u h swi a d edde a occur iak the ma imum tu b lnce o the p lmo ary id f th f t l a E ten e dilat o of the pulm nary c nus d el p and th ma n pulmonary trunks with th whle of th v sc l a bed f th lu os bec me enla g d If th re v c c lat ry dis b l t t w l d pend th p port n of th system c blood that i hunted th ou h the ductu f f c t o n the form of sub acute bact n iend ca d t u th strept c c u i d s a th ca sat v rga sm acc u t s fo h h p rce t a e of deaths Abbott g es the figu es as 3 5 perc nt of th unc mpl cat ca es m h th p rate ts ha rry d th first f e y rs of l f

Subacute ndoca d t hich occurs n the p es e c of a pate t ductu defi t ind cat n f e r l surg ry d th u s v n more mphat c f there is ny fal e of espon e to chemotherapy I l ta d fecti n n h ch get tuo sm h e tended bey nd th pulm ary r the cha res of cu a educed but l gatur accom p d by ch m th apy may l ad to ultim te ster l zat n n aft th nterval of yea E l perat on n all ca es f n f ct s f lly ju t fied In ca es of pers t nt d ctu th a ra pecta t f l l e s bet t n t v a d t w nty f e y e r T ch ca dia and ex g ated pubat n wh ch r be r u h t hake the whol body con d t o wh h dem nd th con d rat of u g ry Th r fo u r v n a ymptomes case are largely p ophyl ctu cl sur f th d ctus fa s t known will pr nt the occurrence of he rt f l ure nd infe ti n Against ths m st be b l need th n k f operat o

The reason for co tin ed p t cy f the duct arter osus is a matt r for conjecture The ntra thoracic n gat e p es ure occurs g with th first breath of life udd ch ges ort a d j l

m n r y p e s u s a d t m p o y l r g f th sy t m i c t n n w h e th placental circulat ha bee x l u l h v e been ad nced s po bl so s f r th clos re The nat m c l relat f th ductus with th aort c rch i a fact r h ch h u l t be con d ered I l th ductus placed that th angle f rmed betwe n it a l the r t c a ch ac t th flush of blood thr ough the a rta t nds t s r e past the d ctus ope i g If the ductus l e l acutely the rush of blood may imp g n the m th of th ductus a d maint its pen ng

The surgical tech ique of cl u is l r b l d t l Te case reports a e p e s ted

Occas o ally n ap al v t l mu mur pers ts Th e ag rated pulm n r v a c l a m k g s l ppea slo l a also does th n l r g l pulm r c nus Mult ple fluffy patch sp o d ced by faret n n i f t d cases cl ar qu te rag l l an i t appe th n t o r thre e k S gns of t rbul ce ascular fit l a ar imm diat l red ced but may t d sappea c mpl t ly f se eral m ths Th r ha e be n r co d d nt c es f u r nce f th typ cal p t nt d ct s m rmu l th ill Ths ha usually r s l t d f om the l gatur es cutt g th gh i th r establishme t of th f i t ut th o gh fal v sc l cha n l The ch e f l g t m t r l a d m thod of l gat ha n t be f l settled I m f cted ases pers t nce f i r sug est n i mbol m a n l t n f r a full cours of chem therapy t d al th eg tat wh ch ha arsen s tes th r th r a th du tu

I c d d the tho tes that pat t w th an unc mplic ted p te t du tus a teri s th isk of ubacut bat r l d s t n an h t fal l gatur f th ha l n l d t k ng el f i h h p port on of ca s v bsol t d t on f r l atu ly f t l l r n ble p ocedu case h ch h w s f comm c n h a t t a l e

H r x F T M I

P nd r grass R C Cardl c Ch g In A r c l n s f i t u l 4 m J R t 945 53 4 3

Th a th states that f the most f q t a d n o scula r y ries f mod m rta art r u s fist l Th eff ct f a a t r n s fistula upo the culat g ral l upo th he t particular a so m p t n t th t the tt t f r nt l msts h l l be l l e i t th cardiac cha ges d t t ths les A these ha es s lly e ers b l by l m at f th fistula t mporta t that th ca be recognized Th heart hanges f benben m x d ma and hyperthyr d sm at t m at r r s ble C nstr t i perica d t u s l j t n d tus r t r u f f brillia t examples f th ber f l flect f urg ry th mp m nt f l u v g al l m t f r t

fistul is qu lly dramatic Any patient exhibiting cardiac enlargement without obvious cause and who has received b ttle inj res should be ca fully exam ed for n arterioveno s fistula Th s includes auscultat on of ll w u s

McC'r a l his a ocates demon trat l the f ll ing ch gss associ ted th the establ hment of a large art rio ous fistula () fall the mean arte al blood pres ea d accel ration of th pul e (b) nreas f the carli co tputa l stroke lum (c) le at f the enous es r d stal t the fistula but lttl cha ge i the veno s pres ure proximal t the fit la a d (d) acceleration of the loc ty f the blood fl po mlt th fitula

Thirty cases of arteriove ous f t la ha e be s t d ed r tge graphically with spect to carliac m me t b f re a d after sug cal l tion f the f t l The t l s are l c t d t d the inve t g to f () th detecti n f ca d c enl gement (2) th effect f t mpra y nu lobliteration f the fistula (3) st dy f the immediate post perat e cha ges an l (4) th t l changes i cardacs ze foll w g perat e l m t n of th fistula Th m a m t fca d c e as bas d the m f th ght and l f t trans rse cardac dam t rs n oe t g n grams taken at 72 ches f ll n p rati th 50 m a d 1/10 cc d

The m t t kng f c t which l l fr m st d s o th e tnce of c rdac enl g m t n art ve ous fistula th t many c h wing norm l carl th ra c ratios and n b malty fca l c tl h bted let n t d a i rda ca ur m t f t s g cal m at f th f t l The card c nl g me t w t exi lnt wh n comm ly ac ptel st d d re ppl l t t only b cam l t wh th post prtie e c mpa l th th p j rti oe t g n gram Th s dcaes th t h l t h ca d a c h n e s t t t l may b e ly l d am t c some c e s th y ar lat l n d i th r s I pat nts h g t f l ter l a y m d c s l r m c lac ha g m e c l m t t l t l x t g gram C ng t f th f l m r v e s l ted f w t c e s a d th mpr l f t

P t t ty three es m l b f i l r g n n l b l t t f th t l l c p a ap l l t l the brut b l t rat l a d the p l l wed Th pp c bl h g ca l c z es l t f m t mporary elu n f the t t l Roe t g r l l th h art co l l l t l w t rat nd ncr th m pl t d f t c tract

Whl th w s co s l rabl var t in th tme f p pears a d th t t f m rabl cr a d dec e f th tra r s carl c dam t r t f cy wa t w d n n th frst o hours f r p rat n w th lecr a beg g at t y f h urs wh h nt n ed t th ev nth lay aft r p t n

The following factors are believed to c trl ut to the variat n n cardiac size immed ately f llow i g surg cal clo ure f the fist l the size a d d ration of the fistula the proximity of the f tula to the h art the degree of d latat o f the pr mal vess ls and the e t t to hich the myo ca dium is able to respond to the sud l c rculat r v cha g s

A gro p of 32 p tients w r exam nel at ter als varying f m f urteen days to si m nths after surg cal elimi ati f the arten e us fs tula T ty seven i tients sho d n a ag l crease n cardac d ameter of 1 19 cm i patient sh ed an increas nd 4 pat tss w d n cha g s

II R B F T t r o M D

Kidd H A Sut re of L cerati n of the Infe l r V n Cava Due to Bomb Spli t r B I J S g 945 3 s 3

The autho tates that i j ues of the inferior ve a ca a may be due to (1) penetrating w u ls (2) t mal le ce without penetrat n a d (3) injury dur i g g cal operat s A umber of ca es lue t the l t ca ha b n reco l l but rec ery fr m hemo rh ged to th frst t o s u c m m n l h s due to the time f c t or and to t l es nce of other bd m al les o s hich may f themselves i r f tal A case rec rd s g n detail i h h th pat t r cov r d aft a p c trating wo l f om fly g bomb f agm nts

N e cases of rec v y follo g jury t the i fe ior v n ca a h ve been rec r l e l g t n l v p c ticabl bel w the tra ce f the r l i ns but in no c e after l gat re d d ed ma f th l g persist Wh n time f mportance the m j r l p c elu e of lature f th cava may b f l s u e l

Int r st ng fe tur s f th c e due t exte r al l c p n t rat g d reth l p e of t m b t e n th inj ry a l p rat on and th perat e r d g s h chr al that i th larg m j r ty v ly a r lat ly m llam t f hem rrhag h s c r ed l t s t n t l t l sug n expo es the j r el n ca a that the e spr f l l e d g Taylo sug gests th t h s d t th fact that the w nd i th cava a d th e i th ov rly g p t n um t perimposed but t ems p s bl th t t l tra al l m al ptes is also fact r r h d f the bd m l muscles being p esent n lsh ck ca g c n s l r all f l l th blood pres u

Wh nabl m n ha b n opened bef r t t p r t al hemorrh g is pl ed p h l l bem d f r blood tra f al quate es t th t f i j ry a d good illuminat n nd th r q s tesut m tenal sh uld b prep red

II s r F T t r o M D

A d rson F M d P t t r s n R II Phil bog raph d Treatment f V n Th mbo l North r t M 1945 44 178

Th a th r s st t that phl b e th r mbo s i th form f thrombo th t of g cate st la r e r a it

may give little or no indication of its presence until it causes pulmonary embolism. Thrombophlebitis is the most inflammatory type giving rise to pain, tenderness, edema or elevation of temperature, pulse and respiration. In it, the redness, swelling, lass, cyanosis, albed lenses.

The thrombus usually originates in the venous plexuses of the calf of the leg. It may remain localized or take any of the following courses: (1) propagate up the femoral vein to the iliac vein, then to the aorta as loosely attached soft thrombus likely to break off at some point and result in pulmonary embolism of varying severity; (2) may propagate in situ, remaining to fill the venous completely and become adherent to its wall with extensive intubation and reaction in the walls of the veins and the perivenous tissues. Thrombosis may be made signs and symptoms both local and general in other words, thrombophlebitis. It may go farther and complete femoral extension with blocking of the vein and a marked increase in the inflammatory complications against the picture of phlegmas alba dolens.

Soldier returning from overseas units had sufficient discomfort in the thigh to call to his attention the possibility of a thrombus. He had readily evident venous obstruction, marked irritability and tortuosity of the veins in the phlebogram. In these cases the authors found the usual clinical test of patency of the deep veins to be uncertain and unreliable. The phlebography technique is described in detail.

Advantages of the phlebography technique are: Venous need rarely be cut down upon; a definite procedure can therefore be easily repeated.

Two pictures of nearly all of the extremity are obtained.

Thromboses confusing superficial veins are usually not shown. If necessary, it includes the superficial veins the tourniquet may be removed after the first picture.

If present, competent in common catenations will equitably be demonstrated.

The technique is a simple and not requiring special equipment and quickly acquired by rapidly changing rotation of the x-ray.

The case report is given in detail. Heparin produces clotting by reducing the adhesiveness of the blood platelets. Dicumolone promotes sagging down the blood by thrombolytic inhibiting its formation in the liver with clotting, coagulation and impairment of the tract. Large doses of prothrombin with venous damage in hemorrhage. The authors do not recommend the dicumolone employment of large doses in the prevention of thrombotic events; however, the following reasons: (1) when thrombosis has already occurred, its diminution does not give a rapid or almost complete relief from pain as does heparin; and secondly

(2) it is not generally accepted that they preclude the possibility of venous fatal pulmonary embolism from an already formed thrombus. (3) they may be causative factors in venous or venous fatal postoperative hemorrhage. (4) further propagation of thrombus may result after dissection of these medical cases. (5) the dilated venous channels are left in contact with and may result.

It later reoccurs in thrombophlebitis, especially if the patient is later bedridden by operation or other illness.

The Surgical Staff of the Letterman Clinic at Hospital San Francisco, California, believe that in ligature and section is certainly the procedure of choice in the case of a patient with venous thrombosis who has had a pulmonary embolism of a degree which has an cutaneous or filling of the chronic venous thrombosis who is difficult whether or not there is a peripheral venous embolism or who develops thrombosis still in the presence of a multiple stage operation.

In conclusion, the authors state that phlebography gives information that may be useful in determining the type of treatment for cases of chronic recurrent venous thrombosis with the various complications including aneurysm, in chronic emphysema, sufficiency and peripheral thrombotic aneurysms. Obstruction of the deep veins, true, may persist for many years. In some of these cases, in which the roentgenographic picture is uncertain, phlebography provides definite information regarding the venous circulation in phlebography. It is or it is not an important change in the management of the case.

If the indication on the extremity of the choice for nearly all cases of cutaneous recurrent venous thrombosis, phlebography is usually as a preliminary ligature in the cases where the definite clinical findings in pulmonary embolism with the clinical evidence of venous thrombosis. It may be used as a guide to the treatment of the origin of the embolism. In cases of lateral thrombosis, the ligation of the apparently unobstructed extremity should always be given careful consideration.

The milder thrombotic venous signs of the thrombotic grade is the chance of embolism. Also, the more recently the thrombus has formed, the greater is the chance that a complete dissolution will be achieved. It is earned that the facts have the hazard of waiting to see what happens in the case of mild or doubtful thrombosis.

H. J. F. TUCKER, M.D.

ALL N. A. W. LINT, N. R. R. D. Do also, G. A. V. Thrombosis and Pulmonary Embolism. J. Am. M. A. 1945, 3: 397.

Although the authors recognize the comparative safety as regards pulmonary embolism in true thrombophlebitis, they believe that the recognized first few days of the process that this disease can be altered by radical treatment.

They do not believe that interrupt of the femoral
has any place in the treatment of true thrombo-
phlebitis after the sixth day of the disease unless
the patient has contraindications. The earlier the diagnosis of
thrombothrombosis with thrombophlebitis with im-
mediate bilateral interruption of the femoral vein the
shorter the period of disability. If operated and
lysed until repeated infections have occurred with
long lasting phlebasectomies cause even more than
coalescence will be prolonged and the outcome
doubtful.

B lat ral i t errup tion f the fem ral is a afc
 p c d re which be car iel out on tr mly ll
 p t t a l il p e nt m s e fat l p lmo ry
 mbel m This of t sh ld b perfo m l (r)
 on patu t h have l l d n f al pulm ary
 embol m though n posit e sig s f v no s
 thr mbo is in th le s c n i d tected a d (2) o
 a yp tients wh d lopp h b t s as e v d ced by
 pa t n l n es w ll g n th l w r e t mut s
 d lated su g e r c u a l v s or p n the calf muscles
 o forceful lers l f th foot (H mans s gn)
 It is rare th t l l the s gns ar p t so th t
 the dec s n t ope t may d pen i e or tw
 criteria

Except in rare instances, bilateral interruption of the femoral vein is indicated. All such patients become total amputees of cases through the formation of a thrombus in the popliteal vein, which affects distal limb.

pr ph f ct c lly w th t ha m a few ld ly pa
te t swithint t och t icract r soth h p a t
in s me q g m j ab! m l g r y f r
cancer

I very attempt h ld be made to m k th dag
n of thr boy! b t b fr th f m ral a d
il c s s ha e b-corn m lel by arlv
l e m f th post n rat n la red ced

In ca e ithsem l cth mbo them h n
ical cmo al fth th mb f mth by l
at h sbe d m trat d t b f p ed
lt sh lib d a h a no bl fte th

It sh ill d a ly a po bl ite th
th mbo h be i g l T l s d es th
l l w ll g th l g and h t n th r co ery
a l p vert a f t l p l m mbol m
l th g n f t l p l m mbol m

The authors conclude that the morbidity of thromboembolism is underestimated.

Th a th s f u d th t p t t t p t t d
w ll whil hep zat w ca ed t ly t
ha a cu re ce f th mpt m a l g ft
th h par s t on h f r t t f f r m h

ft th tr tm t b g Th a th h
f l th m th l f t tm t f g t l
pe t f m f t h l curren ft f m ral
A t t rump Th l curren ft f m ral

Demolition has been carried out usually in the morning. The method of the demolition is

become sufficiently standardized to warrant its more
extensive use. At this time, however, it is not as
safe as is obvious as if more than an interruption
JOSEPH K. N. R. M.D.

BLOOD TRANSFUSION

Van Duyn J H Degenerati e Whit Blood Cell
Pictu As An Indicati n of To mia from
Burns A k Surg 945 5 4

The question regarding the presence of a specific toxin in a burn is not yet settled and the current at least six distinct attitudes to be found in the literature.

1. There is no true burn to em
2. Infcti can account for the whole picture of burn t. xpm12

3. Hemoconcentration (secondry shock) can account for the whole picture of burn toxemia

4. Burn t m a c a t b e p l a e d s o l y o n
the basis of pl m a l s s a n d h m c o n c e n t r a t i o n

5. Burn t xemia is a result of hepatic damage
ca ed by a xia i turn a result of hemoco
trition and an impaired circulati n

6. There is a true burn to in absorbed from the surface of the burn and responsible for burn t emia

The period of toxemia has been generally accepted as coming after secondary shock and before the onset of convalescence. It is characterized by the following features:

s t f i f cti W leon has t the phases of burns
m accurat ly as f ll ws (1) p im ry shock up to
tw hours (2) s condary sh ck from two t twenty

f h rs (3) acute to emi from s to one hun
d d h rs and (4) s ptic toxemia after one
h dred h rs

Secondary shock and acute to emia are difficult to date clinically because secondary shock with treatment or not carries over into the toxic

pharmacology and both may be affected by the presence of secondary shock is fairly constant and predictable.

and can be estimated by the hematocrit. Toxemia is erratic and certain and there is yet no laboratory procedure to predict development. There

fore the author undertook the study of the white blood-cell pattern in 4 mice burned by hot oil. He draws the following conclusions: a few hours after

Thrombocytosis is a laboratory finding in the leukocyte count frequently demonstrating an increase in the number of platelets.

vest m frequently demo strabl n burn which is
l t t fr m th d n ry stim latory effect pro
ficed by tra m t i s affected r n cr tic t sue
The inhibi tory effect of the

This inhibitory effect is characterized by degenerative changes in the white blood cells which can be differentiated from the regenerative

When the r/gn ratio blood p/ctn is due t in
 a hematry stimult the dgr rat e blood

I tu s a result of t x c i h b t There i
 th r f true t m i b r i t ct from
 tr m a i h moco centrat n th ha d

Isopentane and dodecane absorption
from the bacteria

Pool of plasma were prepared entirely of type O plasma so as to secure the highest possible agglutination with both anti A and anti B. These titers ranged up to 1:56. Secondary effects (500 cc) of 1 d unit of this plasma pool were reconstituted and administered intravenously to type A or B individuals. No reactions were caused and there were no signs or symptoms of intravascular agglutination from the relatively highly titrated plasma.

Pooled plasma prepared in small pools at hospital blood banks or in large pools at processing laboratories with the blood groups entered each pool by chance. In this selection can be administered with safety to individuals regardless of their blood type and without fear of causing harm because of isoagglutination or of causing a synergistic symptom of intravascular agglutination.

Mar. Lides J. Lut. Ling. F. M. Culini. Ig. Opoth. rape. tic. a. d. Het. h. m. th. rape. ti. Tra. f. i. n. Som. R. ma. k. n. th. Endocri. T. eatm. nt. f. M. n. rrhagia. Olig. m. norrh. Dy. m. rrh. a. and. Functi. n. i. Amen. rrl. (Tra. f. pothérapi. q. t. hété. o. hém. o. théra. f. es. f. té. n. tes. f. ll. cul. t. Q. lq. m. r. q. l. i. t. m. t. doc. desm. é. rragi. q. d. lg. mé. l. é. s. lysm. é. rrh. é. s. t. am. é. h. es. f. t. l. les). J. R. Egypt. M. f. 943. 26. 5f.

Fl. cases are described in the literature. The plasma is a clear, colorless liquid.

treatment of menorrhagia or menorrhagia by menorrhagia dysfunction. The results are good results that persist for from four to forty months.

These results were more satisfactory than the results obtained with any other method of hemorrhage. At first small transfusions of fresh blood were used but later it was found that as good results were obtained by the intramuscular injection of 20 cc of blood into the gluteal region. If necessary, a second dose of blood is taken from the donor monthly. Three days before menstruation, if necessary, the blood is taken from a week to ten days after menstruation.

The authors believe that a careful diagnosis must be made before treatment that the gynecological condition is due to and because as far as possible it will be let alone. The treatment is indicated by a careful physical examination.

Apparently in these cases the results are not better than the use of hormone alone for the same condition. The results are small. The blood is evidently a tissue which is best not which brings about the metabolic action of the hormone. The blood is a catalyst for the hormone. The other action is unknown. The blood may contain the hormone particularly hypophysis. The gland tropic further research is required in order to settle these questions.

A. C. M. M. D.

SURGICAL TECHNIQUE

WAR SURGERY

P W R W Ga G ng n and Vascular izati n
of Muscles B I M J 94 656

The fa tors are esse t lfo the establishm t f
gas ga gr ne—th pres ce f p thoge ccl st id a
a ad q temass of h mic cro t mus l d
delay d or faulty su g ry The first tw e v id
able and can be f f cti ely c unte d by e ly ad
q te s g ry Ap t f m cases in which there is
gross d truct n of a lmb gas ga gene m st l
thal n the th gh nd b ttocks a d all cases of h ll
p n ds i thes a e sh uld b g i e ope at
priority

Mus les are s ppl d by o m rteries l f
o e f these is inj ed that p r t f th muscle p
pl d by the ju ed vess l b comes i h mic R es
t blishment of the c ll t ral ci cul t on with n such
a muscle p pears t be e tremely low a d n ope
wound n cr sis inv riably res lts l f cl st j ar
pres t gas ga gr ne occurs Mu cl depri d of its
blood supply fo ore i h h rs dies If operati n
has n t been undertaken d ing ths pe od all
bloodless muscl m t b xcised l f ne gro p f
muscles is avascula t ould be rem v d l f two
g ps are in l ed th lumb sh uld be amp t ed

If the radial d ulnar art r i s a e s d below
the recurrent branches the f rearm i cut f f m ll
blood pply nd early amputat n h uld be p
f m d l gature of the brach al a try h w
does not n cessary enda ge the l f f the lmb
Wh n a main art ry has been l gat red n th l g th
p t nt should be wat hed h rly a d amp t t
performed at the first gn f cl trnd l f t o
Particularly da ge s the case m wh h the fem
oral artery has be n l gat d a d there s an add
tional wound in the l w leg n such cases primarv
amputation sho ld be d e Severa ce f th nt
rior t bial artery is m e pro e to caus gas gangr
tha severance of the posterior tib l t ry f the
peroneal rt ry can carry on the ircular t i th
calf l f th nt o tib l rt ry g res lature thes
muscles b l w ths p int ischem ca d sh ld b
remo d

Since m y wa w u d are co tam t d th
cl st d a gas ga gr will ns f mple n t c
mu cl pres t Th lum t f th gas ga
gen ca c m nly from e ly a d f f ic t u g ry
which ca be gr tly a ded by th h kn w l d
f th blood pply of th mu les

SAMUEL KAHN M D

Capper W M Treatm nt f Battl W und Tw
St g Operati n Lanc i Lo d 94 48 587

At a f rward base hosp t l n Italy d n th s
months end g Sept mbe 944 4 b ttl ca l
t es were recti d a d a perat as performed f
del y d prim ry ture Most f th pat ta h d

m lupl w und soo e pe ti mght i le th
s ture f w th rm re wou d — ca th e
w e th rte

F succes tw fact rs a t l () a ly
deq te pl n d decompres n f the w u d at
the tal perat n f w d d () fa l t f r
rly tra po tat n of th w d d m nt ce ter
h defi t es g ry poss bl a d wh he can
b tai d fo t d ys m

l th s be n the pol cy t m ll wo d th
theat o the d y ft rr l Th pa t e
pe t seems t ha e t best h c h d
s soo as po bl aft th th rdd y f m the t l
sug ry Th be efit of ly p t t e gh
the dva tag f a v pep t b v d t nty
f r ho rs f p l sta d d q t flud t l k

Att ti h uld b p id at th s st to th n
d t n f the blood Of 83 c cut p t t sw th
ser w u d xam d bet n the th rd a d
eighth d aft wou d g 76 (4 per ce t) h d a
hemat it bel w 35 per t alth gh the maj ty
had be g i e m r p ts f bl od t the t m
of the t l surgy ry The p k d c ll l m sh ld
be ma t dabo 35 pe t i all ca by the
tra s n f fr h bl od t ll th ep thel al b m
p ve ts f th pr t en l

Acco d g t th tpe f w d cou tered t
wast ted w th powd w th p ll solut

Th powd r was th r p ce t p fl n i
l f th ole or cal m p l n both type p
pe d t b of eq al lu Sod m pe cll s l
t (5 nt per cub c t mete) s s d h n
t was mpos bl t obt dequat d b d m t
a l g track g w d th h m l g p r
n vit l struct es wh n t s mp bl t
v d d d p c t w s t d c d th h f
rubbe t bes Ad q t dra mpo t t t
g t rid f the g m g t p s that llect i
th p ces a d th i best m d by p t
f th t be tw ce a d y bef r th t d t of
the f e h sol t

A curse f l f th zol by m th ft ope t
m t b f d f t l c P ll d
p t rally n comp t ly f w ca f th s
b t ths type f dm t n c t i ly of g t
be fit wh t f m l t pl d t mpt d

A curacy f t d k pp m t
amply p d F t f l k m gut l s ly
placed g th best lts d h th k d s
ca t b t hte d t calm ttes s t
p lley t t h f pe l l D p t

t es er b tt m v be d th l tag
pe lly b tt k w d h h th m t
a ce f appos t of th deep t es d f fult A
rt in m t f t may be l l w d d
t th be t f f sta c th ma d
th h wh re th j l d m ll oc po d
t l t O th th ha d o th cap l

gr at trochanter and the subcutaneous t b a l s r
f ce tens on will certainly result in wound bre k
do n Bu d sutu es are for the m st part unneces
sary and it s better t avoid them

D space su avoid bl ma y of the w und
If it is deeply sit at d the best c use sto iroduce
a pen c ll tube with d pendent drain g By the
se nth d y when the t b is emo ed most of the
space will ha bee obliterated b y th fast gr ing
hem rhagic gra lat n t i su th t forms i the
prese e f pe icillin The h le for the drain g t be
can then be utured if n ce sarv Superficial de d
space is a m e ifficult p obl m T tage f the
pace with a p thel al brige i m t rta to
fal It is best eith t r tate a skin flap to f lli t
th underlying hollo o t sutu e the sk n e lges to
the shel i g walls of th g p a d e e the inter
ng space w th a spl t kin graft It mp ta t
t pay cl s att t t gener l p incip l thr
ga dt bly wh a flap is use l f r th i p r
U f th g al r marg alsk i of a wound
th be t po bl co b t h th s t f e bl
th be n th im t pply k graft t the le
n d r at th i st g wh n th f h m l s rface
g es a gre t r k lihood of tak

Th impo tance of firm i u b dag f
absol t f x tion of th f r t in the pl t a d of
ele at on cannot be exaggerated Pl st b k lab
with a l dition i sile slabs as found nece s y ied
with w t pen ve b n lges ha e p d m
t iact th n circular plaste f (as s l) th
ou l w to b in pected f ve days lat
Co t a d c tions to suture ar surp i gly f
The m st mmon re establ hel infect c m
pl t w d ci nd i ol ment f blood
vessel or j t

O r 95 per c t f th wou i h p th l al
c v r n th f urt th d y f r s ut Th cars
a ch al l firm a d d y Whi re l t f the
les n i thed p r t s es may k k r m nth
lss f tss fluland i f c t a p r ted and
the impro d c l t n f th pat t s manifest

All unds are w th sut h we t i al
i deed sm l l wou l th mo i mpo ta t i f m
th point f i w of ec m y f m n po

Th cars f l l ing suture re m pple and
les ih n th th that f l l w gra lat on A
comp r so f 95 th gh w nds sel ct l t rand m
from com al cent-depot co ds h w that th
a rage tim a ay from duty was h dre l a d
f ur d y s f r unsut red w u d s a d ghly e ght
da f sut red on s Th too m l l figure t
be conv cing b t t t e rth th t g per c e t
f the me with sutured w u d s returned to duty in
cat g ry A i comp d ith 95 per c nt f th
h ew l s ere t s t red

O a v rag perfic l flesh w unls re f t f
the convalescent d pot at th end f th th rd week
l the more t ns e w d w th deep mu cl
lacerat n an i tra ks at th f urth t th w k
acco i g t th d gree f k los

CH. REX BAR MD

Hendry R W Gledhill W C. and Pric B H
Treatment of Battl Ca ualties Two Stage
Operation La c l Lo d 1945 48 6 8

Turn r A C Murray A A and Fowl r G A
Treatm nt of B t t l Ca alti s Two-Stage
Operati n La l Lo d 1945 248 621

Atkin J B and H l d n B Treatment of Battle
Ca ualties Second St ge In Two Stage Ope a
t i n La l Lo d 1945 248 622

McEwen R J B Blicke ton J H and Pil h
M F Compo d Fractur of the Femur
Two-Stage Operati n La l L d 1945 48
6 3

Bhatia D D l y d and Secondary Suture of War
W unds Lanc t Lo d 1945 48 6 3

These fi e communications are all based upon
casualties st am g back from th Gothic L ne in
Italy dur g the later summer and early fall of 1944
By th t me the methods of treat g battl o nd
in It ly had become fa rly w ll st nd rdized con
sisting roughly of immed te first-stage operati e
treatment in hich the wound was t immed dead
t sues a d f re gn matter w re removed (metal c
bodies n t c ns der d d ge ously noxious u les
etai d between the nd of fractured bone) an l a
dressing of sulfath i ole penicill n po der or pov
dered sulfanilamide alone or ther availabl s l f
preparation a d fi ally dry paraff g as
plac d ver the open w d Almost all of the i a
tie ts had rece ved a titetan c serum a l a short o al
c rse f s l l mde many had been g n ga
ga gre e rum transfusio s f blood or plasm In
s m fractures of the f m ur a Thomas spl nt was
appli d in others some r t tive dress g a d th
pat ent w s sent back by m n of air or sh p e vacu
t on t the base h sp tal In these e acu t i s th
pe ity of a re vac at n is gra ted but lfe dry
f l point out that th sl er mea g t just about
as good results th r f g s sho that penicill can
v room ny slight d lay in e acuation Later
these sam authors c cl de that wounds n which
penicill sulf thiaz l powder has been used at th
pr mary perati n at th fr nt li s d f f r but l tle
as regards r ults fr m th e in hich a Monam de
powder al h s been used This fnd g ha a
important bea i g on su g ry in trop cal cou tries
wh re penicill n c ld n t be stored in the f r i ar i
a a at the correct t mperat re

S day more lss after th w u l g n at
tempt s mad to s t e the ou d th s b g des g
n ted by s m of th se uthors a th s co d stage
f th operat treatment and by thers s the
d l y d p mary utur of war wound Th ly
co tra d cati n to th sutu e a (i) i uff nt
kin a d () t rstit al cell l i t r gas g ng
F m l t pl wou l s a d d ep open wounds in
commu cat i with fractures are sutu i c mplet
ly if pos ble at l st parti lly pe hap w th
u l rmini g f th subcutaneo s t u At th s
operat n the wou d agai rev sed a i cised f i s
s m necessary (bact rial f i d g s are f n great
impo ta ce cl cal j dgm t w ll suff c) b t i
open fra t res no attempt is made to cl a t th

h matoma t the fract re it th is comm ted
bone fragments and n co id rabi fi rt is r d to
locate m tal fragm ts In te d m add t n to the
tand rd procedu es for th hall w soft c
wound n these fract e ca es a tab w und mad
down to th fract r a d a mall rubbe tube or
tubes acc rd n to th 12 a d s r e f th
wo nd i led do n to the fract e a nd a sol
ti of sod um pen cill sol to n (3 c fa sol ti n
contai n 500 Oxford u to pe cub c cent m te)
ted t vice da l f the tube r tubes fo fi e
da E ch pat e t al o r ce d 300 000 ts of
sod m pe icill n b i tram cular j c t n th
rse c mmenci th da f peratio I
th w k f Atk n t l it rec rd th t a few
p ti nts e pec all th se with gra mult ple w nd
r ceu addit on a hort c urse (abo t 300 000
u ts) of sod um pe cillin pro ed re wh h th y
n w h w e r con de t be unn essary the
m j nt f a es

The standa dized t e tm t t th se ond stag
r uturi f the wound i m e r less s follo
I th operatiu room u de pent th l nesth
the et nt dres (pl t plaste cast) a d
the w nd dres gs r rem ed a o d s ab is
made for b ter l mcal x m a o (th ha ltl
i fi e ce on re tm nt) th w u d a ea i pr pa d
gicall nd th d re sed th re s o
cl de g ntl m rt n f th fi ee into the wou d
t det rmin th xt f th jura d to e s e
th t n l culati n s ex dat a p es nt nd th n
tu e earned ut fne essary After th uture o
f rther d es ng is att mpted e cept f th sod um
pe ill m tilati n i the case of deep wou d as
des ribed nt l th so rtee th d at wh ch t me
th w und reinspect d the perat g ooma d
th st the re emo ed Wh l part l s tu e
ha bee accompl hed at the p ou perato it s
omet mes po bl at this d es period t th r
c m l to the tur perf rm a sk n graft A fresh
pl t is ow appl ed n fract re cases and the pos
t f the fra m nts che l d by roentg raphy
After this furth r m pe t f th w u d takes
pl c t l the sixth e l wh fi l sessm nta d
d po al f the p t mad

With pparently u mportant di id l an
t ns f th m thod f tre t th battl w u d d
wh h has been rou bly ut n d th authors of th
se es of art les tre t dat tal f 163 w rwo d
th results wh h at best are sto d g a d at
worst ompare f rabi with a y comparabl
eres

In th 46 flesh w d reported by H dry tal
th eet mated a rare percentage f compl te heal
ing in t n d s w s 83 N ety pe t f th pa
ti nts h re treated with penicillin at the f rward
stat ons a d 80 per t of those wh w e tr ted
w th sulfo am d were h aled t n d a l a con
t series u d r th sam c d t n e cept that n
local ch m th rap wa sed th percentage of
h al w l 63 f th series f i s ca es f
pe fractures treated by these sam a th rs 96

(per cent) w re closed b th th eek that is
8 (64 per cent) vere compl t l closed w th sou j
k n heal n a d 14 pres rted healthy gra l t
u l Thirty tw (2 per ce t) w e still pe
fract res f th small s l dng th fractu te
is co s d red pen o nd When th ca es wh h
co ld be complet ly closed at the t m of th test
operatiu are a al ed parat l t s found that f
these 86 nd (8 per cent) re clos d n s r
eeks th ly pe les n s i this group were f u d
on th l cle tba and th go f th ankl
wh re th re i d q at ti ue buff r bet ee th
bo and th l In 5 pati t i the hol m r
nal th re s gre t tss lo a d s re fect n
ne e theless 3 f these w u d had closed b the
eighth we k Clostr dial my t w s prese t n 4
of th wou d d nd n the e th c nd t was
trolled b e n nd aft car mp tat be
necessary nl n ta ce N d th re m n
t nd

T m r l reports t o eries f battl w u d f
the rst th r w re 35 p m ary d c
wh l th r t am was fil f r a d r t
Am g these ca es w with g gan n 3
amp tat ns re d ne N l ath occu d i
thes 7 cases After th te m had be n l f th beh l
a d bega ctng a a b e ho f tal they th re
cei ed f r re tm nt n 7 ca e which p m ary
o had alre dy bee perf m d In this m t
n l pon n tit t n f th c d r perat
that ut re o n tt mpt t ut re from th
th rd to the fifth d y f th p m ry w d
s n had be ndo thes uth rs were abl to get
what th y des nt a a su c ful esult—a h al d
u d at th te th d v n 90 (63 4 pe ce t) f the
ca es a partially ucees ful s l t—a h al d
t the tw nt th day 4 (69 pe ce t) nd
i compl te es l r f dure (m pl t l h al l
w u d afte tw ty d ys) (90 pe cent) Th
141 p t ts (60 4 per ce t) r fit lo d h ge t
the un t r the c n nales c d pot bet n th
twenty first and twenty e ghth day A g th se
th re w re lo nst ne f g g r n Of th
latt r cas s 4 w ut l w th he l ng b th
te th day (of co m m ch f th he l ng m t g ob
bl be ascribed to f f te n n f the c nt m
ted o nd th es at th t m f th x t
th f t l n dres tat) O d a
h led by th tw t th d v d ca e as l se l
s a f l ure Th rema 83 p t e t had t u de
g amputat o Here a a od ath r m t o d
Th ca es ported by Atkin f l sst of 84
w nd f which 66 f th w und These
w treat d by d lay d t r (th th d to fifth
day) d f these 5 pr nt d ful es its
(compl t healn by th t th d) 2 presented
partially cces f l ults (m pl t h al n f m r
th h alf f the w u d at th th day) d 26
present d n ess f res lts f the th h alf h d
w l alter t day I l d t th r w r 8
pe fract t t l th ma l ad l
scribed th c es i 8 nsta es d fal re n

s best to j in th two together but when it trans fixes d eply — through the quadriceps or deep to va cular bu dle—each wound should be treated s parately as described F maj m sel w u ds of th butto k th gh calf a ll r f ld a three-day course of penicillin is g n eith tramuscula ly by glucose sal e drip The d is 15 000 u ts ery three ho rs

There is no d bt that pe c ll n has cont ibut d t tle reduction of th m tal ty from gas gangren although f ficient forw rds rgery w ll always be th first l ne of d f se A es n t al part t treatment s ad quate splnt g Q te ap t f om fractures y wound involv muscle sh uld be plnt d the be t f rm being plaster back sl b o a lght cast it should include the y t below fo oth r w th patient tra ls n pain nd th wou disp lled by the rrevol mvments f the amb l ce Experi ce shows th t Crame w e s too sp i gy to gi e comfort during travel e rough ro ds F ally aft perat n the wou d sh ld not be in pected u t l the p t nt has reach d the theat of th hosp tal at which s ture is to b p rformed In the ab nce of pa n and to m a any xposure of the wound at stag ng po ts is meddlesome a d will certa nly le d to superimposed infection

This technique i appl cabl to all w u d wheth f th lmb (w th r w th ut fract re) th chest wall the b ck r the axilla The fl ps f ampu t t on st mps ar lft ope en two gud m stitches ar likely t result n th accumulation of lot wh ch i turn s a sou of ps s

If th re b a y who would cr tize th gen ral m napem t of w u d in forw d areas t must be r m mbered th t the traumatiz ng effect f the s b seq t ambulance journey r ro gh ads domi nat s the t t es f adva ced su gical ce t d to a la g ext t d ctate what f rward su geon s may or may t do Af dam nt l fact n th pol cy f del yed utur that th suture must be per f rmed n t l ter th n from the th d to th fifth d y The respons b lty of g tti g pat ents b ck to th has ho p tal rests w th th f rward units and it m ans that pati nts should rive not late th f m th eco d t th fourth d y Her d f ficult es rise fo in this m ang warf re f s es of e acu t re stretch d nd u certa and t i n t alwa s po sibl to deli rpat ents to the bas less than eek Forward ho pitals d e n t und rta k thei own d lay d utures u less they can hold the cases f r t l a t ten d ys which may be impos ible in tmes of stress d stitches and ambul nce jo r n ys are incom p t ble

CHARLEY BARON M D

Lawr R. Prim ry Closure of B tti Wounds f th F ce La d Lo d 945 45 6

In w und abo t th face maj r clos re i d fined as one in oving compo d fracture of a tral buccopharyngeal ca ties b t ther closures h w r large o exte s e are la sed s min r Com plicated impl es compl cat which in ttabl makes th cas a lon term o e which must be

ted to base Primary clo re i lates compl t closure w thout dra ge f the facial o i f poss ble with f rty e ght h urs Th s s th ppe l m t f safety n wh ch primary heal g three days may be consist tly ch r ed

U d loc la esthes a w d to let i d ne th k dres are cised d nd rm ed l h most s is cured by hot fla n pa ks A s but eo t asu laye is th n fash da d losed w th e t g ut the sk n s accurat l s t red and a pres ure b d g ppl ed E n tral clos res antral hemo t sis is eured w th vry h t flax ne p ck all frag mented bon nd lacerated soft t th t has n funct on l mpo ta ce r ch nce f sury al s r mo ed m rg al k se cis d nd u d rm ne l n l about 1 5 gm f pen cill n f th azol po d r s appl d Th w d is accurat l clo d (th r s us ally n ad q ately dran g traumat c a al trost m) th deeper soft s s y w th b f cat gut a d th sk w th f sl k l paraff g fla e press re dres g is ppl d and th utures are remo ed th sec d th d o f u th lav aft wh ch d ess ngs re u ll om tted All antr l c ha e rout n urse f ral ulf th t o gm every f r ho rs fo f rd I cases f ma d bu lar comm nut n u l g the tooth s ckets bon supp rat on common d t l f n w e to dra the w und Most of the cas h r repo ted were operated o n a t ted th t r th t the se of Gow ns o glo res

W th the method h r d scribed 27 perat w re do e 379 f wo d d t 134 of the e pat e ts were y t m d to d ty w thout cuat o to th base Of th 379 p te t 14 had pr m ry wo nd l s res of thes pres nt d m jor unc m plicat d cases f w h h r t ed to duty aft a a erag f s days and w th i f ct n after twel e days 3 w re e cu ted Of th a p senting compl cated cases (ol i g th ja s) all w eyacu ted a d d d Of th 50 present g m plicated min r w u ds 53 turne l d to dy after an a erag of f a d th tenths d y and 3 r vacu ated O e pat e t of th g up of 9 w th compl cated m r inj es d d

Ad a ta es f th m thod are (1) q ick r c v ry () red ct on of h fo th d ers d (3) few e m plcat n Ev k n los (co t n) n tra d cat n partial l s suall h ld d spl t sk g fts ca b u ed t cl e the res dual sk n d f ct JOSEPH W B M D

Ogil W H S rgical Lesson f Wa Applied to Civil Pra tic B t M J 94 6 9

W th regard to po b lites of apply g the les so acq red in the war to the p b l m f e l pr d tee th progres ga ed n this w r t l d b fly as cor utin f three pha es

I th first treatme t by the clo d pl t s m th od wa the rul I add t on t th mm b lizat n w th t co tnet pro ded by this m thod f e drainag a d ch m th rapy w re u d w th sk n co r t lat dat Th clos d plast m thod is

safe and good excellent results under desperate conditions and when the wounded arrive in numbers too great to allow frequent supervision after operation.

The second phase wounds were closed and drained the limb as immobilized; a padded plaster cast or mesh form splint box splint and sutures or skin grafts as attempted about the third week. It was so near the surface was covered with healthy granulations. This seemed the best that could be done in the period following commutations a deep suppuration.

The third present phase is that in which the wounds are closed by the forward group and closed by delayed primary suture at the last between the fourth and sixth day. At the primary operation or call of excision of the ends a lid is there removed and all laminae of the cut away by the knife. The cells to the access to the pyrolytic but by the barst edge of the vessel; a layer of trimmed fat sample of the usual value led gauze applied to the surfaces of the open wound and the limb is immobilized in plaster. As soon as the patient reaches the base hospital the possibilities of suture are decided by the study of his general condition and the first operation the day following.

The patient is rested for a day during which no defecation in blood coagulation is made up by transfusion. A fourth day the fourth to the fifth day in the patient's health the following aseptic treatment of the dressing is moved to the wound surfaces by glass bed as little as possible although some tags or pieces of exposed material left at the primary incision may be trimmed away. A day after the wound appears to be clinically healthy at this stage (even though it may present on culture a harbor pathogenic bacteria) the patient is then treated. The skin is brought into position by interrupted sutures of some unabsorbable material which may be taken up deep layers but no buds are sutured. The limb is finally immobilized a definite plaster cast and the stitches are removed between the third and fifth days.

In general the method described for the third phase is developed into the fourth phase. The following general principles are recommended for the patient to civilian practice. It should always be remembered of course that the wounds in civilian practice tend to differ somewhat from those caused by modern warfare so that the various phases may be modified as necessary. The first contains at the same time for these reasons a too rigid comparison is not made but the less the wisdom of the best treatment is a definite value of the surgery by suture or skin graft before the changes of the limb to the patient's condition is limited. The method occurs can be well be given.

Of course the military group has a general perspective in many matters. The general principle of operation is surgery a deep phase most important alterations in the judgment of the doctor.

Shock and shock. Plasma loss is the chief feature of the shock from burns and blood loss; the chief feature of the shock accompanying wounds. Plasma may be sufficient after burns but in wounds shock the loss of blood must be replaced by blood. Irreparable damage is done. It must be replaced rapidly. At the rate of a pint from ten to fifteen minutes till the systolic blood pressure has reached 100 mm. It must be replaced quickly. If the patient is anemic on admission to the hospital the blood deficiency should be fully made up before the operation is started. Calorimetry shows that men with a hemoglobin of less than 70 per cent show little violence of repair in their wounds but start to do so after a transfusion of 2 pints and that men whose blood loss has been fully restored within a few hours of wounding seldom get gangrene. If during the operation the venous pressure is too low more than the usual amount of blood replacement should be made in most cases before the reaction to the anesthesia and operation handling is over and his circulation requires no more can be assessed calmly and accurately in the ward. A blood drop should not be set going at the beginning of the operation unless a blood loss of at least 2 pints is anticipated.

As regards the loss of protein in burn patients and in cases in which they take as low as in starvation, the effect of the plasma is valuable. The protein content of the plasma is 5.5 g per 100 ml. 6.7 per cent often to not more than half of that amount and replacement may be made dietetically with eggs, cheese, and other easily absorbable proteins. In the latter may be made by transfusions of plasma or perhaps when the need is extreme by the intravenous administration of amino acids. More recently the value of intravenous administration of amino acids in combating liver damage has been shown.

In the field of chemotherapy it is believed that as soon as penicillin can be produced cheaply and in a stable form that can be given by mouth the use of sulfonamides will almost disappear unless fresh compounds are found which will cover blind spots in the penicillin range. This prediction is made in spite of the fact that the present sulfonamides are preferred for infection by the bacillus coli group which are sulfonamide sensitive but penicillin resistant.

In concluding the author advocates the pyramid of possibility principle in the interrelationships between the individual physician and civilian practice which he intends has been attended in military practice. This should take the place of the free lance method of the surgeon with neglect of special training and practice in surgery. In this connection he also advocates the teaching (whether perhaps the concept of surgery of the hand) of very much less operative surgery to undergraduates and recommends the role of the operator at the theater and the graduate level in the operations of increasing difficulty of the postgraduate student who tends to pass to high quality second and tertiary surgery as a career.

J. N. W. BRENN, M.D.

OPERATIVE SURGERY AND TECHNIQUE POSTOPERATIVE TREATMENT

Ransohoff J L Th S rgical Tre nt nt f
L mphed m 4 5 5 94 69

The t e m nt of el pha t ha been p
z l gone a d s n t fluc c d b et log cal f ct rs
which the a thor clasifies as foll ws () filarias
() obstruction f the rml lymph ch nnels by
inflammat ry rsc r t a d (3) b truct n of
the lymph chnnels by some ob cure les n re
d op th c b truct

The auth r bel es the p rat suggested by
Handl y in 1908 h uld be g v f rther t n l sin
the knd leo p rat tes a d h g n
differ t results The pnciple f the H ndley p
t t bury l g lk sutures in th edemat s
ar a t s rve as p m nent lymph cha els a d t
c d t the lymph av from the fected a to
m l lymph chnnel

Two cases a e pres t d i wh h modified
Handl y p ration was p rformed Double tra d
f N nylon were ed in pla f silk a t w s
th ight they uld b les r r tat nd rem in
th tissues i d fi tly These tra d were th eaded
under the s p rfi l fa c a th u h mult pl mall
i cs s al g the i ol ed t em ty w th es
pec ally co tructed prob Almost mmed t im
pro m t snoted w th b ide c f th w lin
Th e s no ecr t f m the wou d a d th
sults were grat f g DUGLAS R. MORRIS MD

Brown J B nd Cann n B Full Th kn ss
Skin Grafts from th Neck f Fu ti n and
Col in Ey l d and Fac R pairs 4 S t
945 639

Full thickne skin grafts from the n ck d cl
c la rego are recommended f use in y l d d
f c repairs becau e of their s peri qual tes f
color m tch ga d funct n Th as n t ral red
n ss in the e grafts not fou d in th ki d th
thickness a d soft e s allo s f th best kn eus o
functi n of the underlivng m cles Late f ct
cell nt since there is m mal c tractu f th
graft b d when the graft re ed

The sca red d formed area is diss t d free d
a pattern f th result g d feet prepared with plo-
film o cell lo d Th pattern is ma ked ut usually
just bo e th i th d of th la cl d th
graft rem ved n the sualm The d r t
m v be l ed part ally cl sed a d partially l f t
pen rcoered th a p t graft

The grafts are t n place accuratel w th int
rupted sutures f lght lk d th e d s f th
tures re l f t 4 inches l f s b e q t
fix t n o e a waste form N h les are cut in th
graft wh h s coered with fin mesh greased
gauz and a wad f rm f wh t cott mecha
cs wast packed carell r th s Appropnat
ppos t pairs f ut res re th n t ed firm r e th
wast as th assista t compreses th form with h s
flw ers or in truments

Dressings reappl d o the th rd t s th d i
s bseq t o es repe ted s necessary th re
u all left off about the tenth d y In a w d e x
perie ce w th th techniq e the uth rs report
f l l th ck ess l es Jos J McD LD MD

An bro F P P lcut Press re R pirati n th
Treatm nt f Acut Pulm ary Ed m 4 m J
S t 945 68 8

T o cases of acute p lmo ary edem are ported
in which posit pressure resp rat n th o yge
was foll d by prompt clearing f the cond t n
w th reco ry

The first pat t as a phy who took a
e d se f sedat med catio th nght nd m ra
ing bef re peration Re p r tory depress n f l
the perati p oced re was sid red th i
t l cause f the de pread pulm ry ed ma th t
nsued I hal t foxyg n b v cath t r ma k a d
t t fa led t rele e th rth cya os th d m
Th ppl cat on of po sitive pressur th the a es
thesia mask resulted n sw it cl ar g f both Th
th rapeut c procedure ppeared t b th spec f
rem d l age t s ce th s gns of edema recurr l
wh n the pres re was thdra a d aga dis
appe ed whe th press re was re ppl ed

Th p lmo ary d ma th seco d p tie t p b
ably res lted i th m i f m the p mary trach al
bstru to wh ch ces tat d trach t my d
was aggra at d b v th b l l val ct f th t
gauze at the t b ope g wh ch es lted a
ere sed reat trapulm ry pres The re
m al f this ball al e p od cel som mpr
m t n th pat e t c d t b t sh w lterally
drown g n h own s c t ntl po t pres
r resp rat d mmed b ck th fl d A simpl
app rat s was co truct d hich ff ct d th
promptly d effie thly

Sin th re ery f th p t nts c l d be
attributed d rectl t po t pes p rat
t s r comm d d that a m widesp d f
th th rape t p cel be ad pt d i c mbat g
what so q thly ga d d as a t r m l cl cal
t Alth gh all a m n t r a t so fa
ably th pre t n f phy i l form f death
m make poss bl pport t s f re ry th t
w ld otherwis not be p ece t
S M K MD

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

B rn B H Y u g R H a d M H C M
W nd f th k ee J l t Lancet Lo d 94
48 5

The treatm t pr gnos d res lt of gu sh t
w ds f th k ee j t ta d th N rth
Africa campa n r discu sed Pat t we e l
m tted t th hospital w th T bruk ca t from tw
t ght d a s ft ha g be w ded P n t
d m s n all f th m had had prim ry tre tm t
wh ch co ssted f

a E c on of the nd ith n th first t t
f ur hours
b S tu ng of the yno al memb ane when r
posibl
c Loo e p cking with sulf lam de an is ft par
aff n gau
d Admin strat n f p cillin intra art cula ly
a d/or ntr muscularly

With fr m twelve t wnty f r h urs aft r
admi so the cast was remov d and the w und
sp ci l O ly 8 cases as there frank pus n th
joint cavity There was a rema kable abs nc f
str ptoc cal and staphyl coecal infectio M y
bu s c nta e c lso m b cill p teus bacill
and d phthero d bacill and some contained ac
ob c bact r a

An t mpt wa m d to cl se ry und
layers Wte clos re of the syno ia as imposs bl
a effort a made to clo the capsul anisk com
pletely It as co lero l m r impot t t keep
gram positi bact a ut f the j t th t all
dra age for gram n g t e p s wh ch u ually ul
be erom by natural res t ce Mot l th pa
t t s cre g e 2 000 un ts of pe iclin th ce
h urly f r f ve days

Of the 76 completely tured p wo ds 61 he l d
bv first intent o Fo j nt conta f bacill
c l pus at the tme f utur Thes j nt
a purated s eral times b t all d el pel a
In 5 ca es th w u deo l l ot be l c mpt l l
n d a nus d f pelin ll f th es All told
16 nus w l served 5 f wh h still pe
ft x m nths

All f eig bod es if ssibl h l be m d
at the p m ry operat For g bod t d
i some ds we m ed t th eeks
fter adm ss o A marble s d f gn body
f t r s tu n 4 ca es f all 4 ca t became th
ca s infection o ir tat n dh d t b mo d
at a lat r t t I ma y n t c p c f cl th
ing or gra s wa f un l n J d t n t h ll frag
ment Th also ha it be ren d b au ry
f t n it ha b fou l t be a f r th f
mat n of a sinu

Aft r th p t a l t c t a l l d t
the e trem ty a large win l w l e g l f t er th
k joi t The cast w ally r m ved afte t
days A ry often th k e j int em d sw ll
f abo t ght w ks As long a th j t r m e l
p l m me ts w re co rag d In a es n
wh h ell gof th j t was a oc tel with t
te d mes a l p the extrem ty r qu red re t
F j nts that showe l b c llus-col f ct de
f pel a f f t arth t s with de truct n of th
a tculat g a tag

Int a ticular adhes s we tre t l with pas
t th g man pul t s und r th d
er f w ca es by rth t my a d resect f
th fibro s ba d Fl contract res w re o
n b tratio l e c tra t h d t be e
eried by me s of a St inn p th gh th t b l
t be cle

Of 101 pati nts th s tr at d 5 had n rmal k ees
15 had usef l knees with a ra ge of mot bet een
28 and 135 d grees and 11 h d stiff kne s
Groz E I R I M D

Smith R O and H f d C C The Admi l tra
ti n f P nicillin by Co tin ou Intram s
ula Drip J Lab Cl M 945 30 5

Th p po c of th s study as t l t r m q an
titat vely the blood le els obtai e l by vari s l
ages of pen cll n admini tere l by cont u u i tra
mu c lar drip and to evaluate th practic lity f th
method th treatment of h ma inf et n

The a th es find that th c nti u u i tramu cu
lar admini tation f penicillin aff r l a pract al
meth d of ma tain g relat ily h gh conc ntra
tions f penicillin n th bloo l but th w th th
pe cillin j e p r t s n v a ail bl the inc f ce
of local r act ns at the site f injecti n v og at
to w rrant routi u e f the meth l at th pres nt
t m The blood lev ls attaine l by the conti u
ntramu cula d p are app r mat l th s m a
th se portel w th th co t u us int a en us
method Th s f ct w ld m t i d cat that n
gnificant am unt f pe icell n i l tr yel at th
i t amu cul s te of inj ct It i f i ter st that
th same lin ar r lati n h p betw en f sage an l
bloo l el appare tly bt s w th both th tra
v no and i tr m c lar ro t Bloo l v l as
h gh s 2 or 3 u its per cubic c m t m r m y b
c n t sl maint n d b th ntr m culum th
oi It ggest l ther f r that th m thod m v
b m pl j d adva tage u l th t t t f

f ct ca s d by r l t l re istant b ct a
M e th n half f th pate s treat l n th
pre nt tudy d loped l c l cto s at the t f
the contin o s tramu cul inj ct ns Such loc l
reacti b b d cr bed by pr solvers
It sho l l b po nt d ut that r l t cly rul j repa
rati f pe cll cre u e l n th f t stu ly
and i th t u ly r port l Tler is alrea l
uggest e e l ce that th inc nce of l l e
ct s f ll g i tramu cul rin) ct n i n v re
ly p opo t al t the puritv f l pe cilli em
pl yel It is conceivabl th t n the n ar futur a
crystallic f r m f penicillin w ll be ava lal e f r
th rape t cu l m re highly i rit l pr p rati on
f pen cll f t t ca l calr ct ns at the site of
nj ct th c t u us nt m cul r method may
be retai d justifiably as a m n f admini str g
nte i e pe icell therapy

B J M C LOMA M D

M t h N and R w l R F f l llin by In
h l t i n La f Lo d 945 48 65
C l c m pen cll m t prod lly a b l
und 3 gen pres ure a d dm t e d t s b althv
young m n wa ery r p lly abso bed thr ough th
m cous m mbra It wa c mput f that half an
h ur i balatio f the m t f m a n l l g al
pa g f m s t i l t f v g n per m ut a l
co taini ga trala co sol t f pe cll n of

B J M C LOMA M D

M t h N and R w l R F f l llin by In
h l t i n La f Lo d 945 48 65

C l c m pen cll m t prod lly a b l
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h ur i balatio f the m t f m a n l l g al
pa g f m s t i l t f v g n per m ut a l
co taini ga trala co sol t f pe cll n of

for and more specialized applications should be fitted to the experienced anesthetist. The percentage solution has become routine in most places and enables to have an advantage over the more difficult solution in that the possibility of error is less. The apparatus which offers the greatest opportunity of type of tension tubing which permits singlehanded administration.

The use of the combined type of intravenous anesthesia has increased steadily. Myer reports that such combination is permitting reduction in dosage and undesirable effects from the agent. The combination of penthalflorone and anesthetic and the intratracheal tube with the simultaneous administration of oxygen and nitrous oxide are being used extensively today.

Intravenous anesthesia as it is known today will continue to play a major role in the surgical future changes and developments will doubtless depend on the solution of the problem probably different agents. It likely that in coming years will see penthalflorone used in combination with more agents than it has been in the past.

MARY K. R. M.D.

English U. H. Spinal Anesthesia J. Am. M. A. 1945 3 256

The maintenance of a patient in anesthesia still the lack of experience of the physician. The Too much emphasis has been placed on the selection of the agent and the method of administration. The administration of an anesthetic is a complex physiological and physical process. The selection of the proper dose and the proper administration of the anesthetic is a problem of the physician.

The principal advantage of spinal anesthesia is the attainment of working conditions in the abdomen. The difficulty in obtaining sufficient depth of anesthesia without discomfort to the patient is sufficient during respiratory depression and circulatory depression. The administration of an anesthetic during operation and the physical objects on the part of the patient and surgeon to the patient's being a hindrance during the operation.

In order to have a general upper abdominal anesthesia the maximum concentration of the agent must be also given to the root of the upper part of the abdomen and the part of the spine in the lumbar area.

The anatomical factors involved in the distribution of the spinal anesthetic are related to approximate the problem associated with distribution of the major portion of the anesthetic to the nerve roots of the upper part of the abdomen. At the same time stopping the agent in the respiratory apparatus.

The factors which influence the cephalad progression of the agent in the spinal fluid must be also considered. The speed of the agent in the spinal fluid is determined by the density of the fluid and the density of gravity in the agent and the spinal fluid.

Anatomical factors such as spinal curves and anatomical adhesions. By maintaining a constant tilt of the table with the head down from the horizontal using an anesthetic mixture of a constant specific gravity allows the patient to fluid and maintain a constant rate of injection in the same lumbar interspace. The height of anesthesia can be fairly accurately determined by the level of the vein.

This variable is the time that the table and the patient are kept in the head down position. Clinical experiences in over 15,000 patients have shown that this method is highly applicable. Ten percent of cases with a specific gravity of 1.039 is the minimum specific gravity which is used as the diluent. The anesthetic solution heated to the spinal fluid. The expected spinal anesthesia is a total solution of sodium chloride with the anesthetic agent used. The 1% lidocaine plus 5 parts of 10 percent dextrose has a specific gravity of approximately 1.07. The thickness of the interspace is the position of the injection. The height of the patient at 0.25 cc per centimeter of the height of the Trendelenburg position of the time the table is kept in the position determines the height of anesthesia after which the table is leveled.

Respiratory impairment should be recognized immediately as the anesthesia progresses. The intercostal muscles become paralyzed and the thoracic diaphragm is further paralyzed. This is in order. At this position the conscious patient attempts to breathe so that the chest cavity is used as a reservoir for the respiratory air. If this condition is not relieved hypoxia and circulatory collapse will develop. Mechanical rhythm can be corrected by manual pressure on the administration of oxygen. The duration of the anesthesia is thus limited. This period of respiratory depression usually lasts longer than five minutes.

A fall in blood pressure is usually related to the intramuscular administration of a combination of 5 units of pitressin and 25 mgm of phedrine. In the presence of a reflex fall in blood pressure from a fourth of the total of this dose can be given intravenously. If the patient retches and vomits which occurs during the spinal anesthesia is more than momentary the patient should be re-dressed unconscious by the administration of inhalation agent or by intravenous administration of pentothal sodium. Allay's apparatus administration of morphine and allay's apparatus administration of morphine. The placing of a traction needle on the greater trochanter of the medial malleolus permits the patient to move in the position of the leg.

With the increased use of continuous spinal anesthesia the need for supplementary anesthesia for longer surgical procedures disappears.

If a control of the anesthesia is combined with the judicious use of supportive measures and supplementary agents there are few patients to whom spinal anesthesia need be denied for surgery any part of the abdomen.

M. A. R. K. M.D.

PHYSICO-CHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

H L Y E H Rosenth I L M and Anson B J
T-mography f th Skull Rad of gy 945 44

T-mography r body sect on roentg nography is be g used s c about 930 a d i grad ally but stead iv g a w g nev d ocates The m thod espe ll luabl i the xam nat on f the skull laryn a d th rax

I 938 Leborgne vis ted the U ted States a d assted in th des m and constructi n at the Chi cag Tumo Inst tute of a tom raph c apparatus imila to one that he f rmerly bu lt i Urugu y Ths pparat has been d q tel desc bed by Caulk elsewh e

The a thors st died the t-mograph c s ct ns of the skull at anous l vels in d ff rent views a d comp ed them with correspond a atomic sect n Cada h ads in relati ly good states f preservat on were us d On head was placed in the poste rior positio nd a other in th right lateral nd left l teral po tions on th roentge o-graphic table and tom rams w re made at o cm l vels f m 3.5 to 10.5 cm from th table top Then the head w re sect o d a tomically the first the co land th cond in the lateral pla es u an tt mpt to dupl cate as mu h as pos bl the tomographic lels D to techn cal difficulties in cut tin it was th ht best t obtan th a at mic sect nly t ppro mat ly 2 cm le ls I th post rior view the sect ons w re carried t po t just bey nd the sph oid si ses s nce it w bel ed that the mainn s ctions w ld not dis clos a tomic tructures warrant a detail d desc ption

Th roentgen raphic f ctors were as f llows () for posteroant no t m rams from 6 t 7.5 L p 100 ma 4 inches distance 2 seco ds posture th k p ncreas gun in rseproport nt th distance from th tabl t p (b) fo lateral t-mographs from 5.5 t 6 k p 100 ma 40 inches d tance 2 seconds xpo th k p ncre in as in the post roanteno riew

Th thors giv e a d tailed descript f all t-mographic danat m c ect ns at an usle els u ng certain bony landm ls f the skull as guiding po nts Alt geth 38 figures re used f th purpose of ill trati

These tud es f the rmal skull are aluabl since they f rnish the ba is of comparison with pathol gical t tes T Lx curia, M D

Lowman R. M and Doff S D Arteriography for th Dem n trati n f Intracranial An eurysms. Jm J Roentg 945 53 34

Egaz No 12 in 192 int od ed intracranial arteriography and n 933 h reported th first

demonstrati n of n ntracra l a eurysm f th ri ht i t rnal carot d artery by m ns of th m thod Since the many im l r eports ha e appeared in the l terature

In the b g in th thorotrast had bee ad ocated g nerally as the most su tabl rad paq e med um How t was soon s pected that part from ts rather f eq ent to city and debatable r a jo-act e effect th r trast cau es an inj ry t th walls of th ves b lead gt actual occl Eks from a d L dre f r exampl noted c r bral thrombos i 6 p r ce t of the brans h ch came to ecr p y after ntracra ot d i j ct o f th ro-trast Later therefo e dostrast eo kod uro- s lecta nd ther peparati mad f r etors uro raphy w e subst tted with t u t w rd eff cts The a thors themself es desp te the f ct that they ha ever obs rved any harm from th th ostra t r n w u ng a 50 p ce t solut n f d ostra c mpo d w th good result

Numero proc du es ha be de sed f t k i g rapids rila gogram th best know am n them be g Moniz m rry go-rou d S ce th exam tion is earned t in th op rat g room the thors employ s mpl f d techn q t l g a portabl roe t n app rat Pr s m d f the rapid taking of lat ral oe tg no-grams asmu ch as this riew h pro d to be f grater alu i th d monstrat on of rym Th f ctors u dare 35 cheski ta get d ta c 8 k 2.5 ma nd second po w thout grid A p rlm ary roe t n rary m d t scerta the corr ct positio n f the p t t a d the the lizat n f th tra ran l c i cu l t n is earned nt by ject ng the t r m l r t d rt bral ar ies u der p per ept c e d t ns S bs q e t roentg gram a mad ft appro m t ly th ee-q rters f th sol t h been int od ced at t rval f th c j th fin l po r be g m d at th d f t l e seco ds Th ject on is perf rm d b th e ro-surgeon Certa k lll f p oced es g th s ccess f rap d j t n ar desc bed

Th a thrs peri c e t d t s es I order t d m trat the d fficult es co c r j in th d gn f tra ran l a ry m th y describe a cas detail d p es t the g ms q est

Th p eoperat dia m s s as d f t O th fifty first hosp tal day g raphy w s d I asm chas ths eal d thep es f rym an ng f m th ntern l ca t d rt ry t ju cti w th th m d d l c r bral ar ry (th so-called pracin dal type a co d g t M 2) th int rml carot d was f rated A mm diat m pro m t f th phys cal s gn es lt l d at p esent tw and on half years lat th pat t is t ly well T Lx curia, M D

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Kempe M and Gibson S Accident IH nging
with Reco ery J P d at S Lo 945 6 4

A study of the report d cases of hang g with re-
cov ry records st ki gly co stent clinical c urse
Th sympt matology usually clud s unco c us
ne lc sat on fr pration for a time fl d
by violent co ulsion nd rrat onality tachyca
da rap l r p t s dy h gua aph nia co ti
nce of urin d feces d lat d p p ls ele t f
the t mperatur f ral day ftr the h ng g
a d complet amnesi f the e ent an l f the p r d
from three ten days p rt the event Rec ve y
salm tal v complet with utr silu l damage
i from the t f urteen d y The tre tm t is
la g lys ppo t nclul g imm d t adm i tra
t f yg by t r nasal cath t hype t c
glu s gi nant u ly a d sel t th j h
n b bital Th ph ba b tal shoul b c tinu l
i mall i ly d sf ma y month ft clinic l
r co ry

Th ffects f ha g g a the ef ld () the a
pa g a c shut off () p is appl d t the
ma n blood ve cl an l (3) th phren c nl agus
nerves may may n t cru hed The seco d ffect
r probably th m st impo ta t s gle fct Th
b tr u t n to b ath g co t b te t th ce bral
noxa m a d th c m pl t c sat fresp at o
i f may rumpo t e hether r n t s lal r
acc l tal hang g vi tm c b r l

T o ca es fac l t h g g in ch lire with
co y are report d S MUEL KARN MD

Lópe I M dLo g O F Th P t in f tl
Pl m in H p t Obstructi I t ru (La
p t as d pl m las t h p to ob tru
t) 4 h g t ferm p d g t 944 9 3 3

The mal ser globul d th pl a
fom r st gm p rth usa l If t fall t l
than it d cates i t la ce fl
f i ct h ch may b m fested cl cally by s p
f es f urin pot perat d nt f th
bd n el ma f l e f the w l t h al

Th a th rs stu l es f t ru h ch th
d rled t th e groups—th e l t hep t t r
hep t th l t t mical b tr u t a l
th l t bstruct by t es Prot i em
was e m ed by of the b l rub n pho i hat
a lla g test a l ed m t ti f r yth cyt
a ll es l i som ls by th gal ct d
h pp c ac l tests Tables g h g th
d t l fth l t f thes tests th three gro p
f ca es

I 3 f th ca es (13 pe ce t) the se l b l
q t nt wa n rmal 3 pe t ed m tat n f
th r ythrocyt rm l I ho ph t m a

n rmal in only 6 pat nts (27 p c t) The Hanger
test was egative i 8 j e r c nt Am ng 7 pat ts
n whom tle cess ca bohydrate test was made it
as normal in (28 per cent) Only 40 per c t of
the pat ts were operat d The mort lity in th
whole series vas 18 per cent (4 pat nts)

It is evident that icterus whether fu ti al r
an t mical there is a ser us lefect n the liv r
which ca be shown by vario functi al test it
a con lition f fu ct onal defecency hich acts on the
pr t s of the pl ma a l s sho b hypoalbu i
nemua with version of the o l buln qu tent

The a th rs treated lver functi n n th r ca es
by gving l i t ch carbohydrate l t act
d vitamins and small tran f n f blood i l th
b f re an l after operation

At v c M MD

Hirshf ld J W Abbott W E Pili g M A
H ll r C G d Oth rs Metabolic Alt ra
ti n foll wing Therm l Burns Effect f v r l
ti n in Food Intak n the Nlt og n B l nce
f Burned Fatl nts t h S g 945 5 94

The auth rs studies ere made t bta n n ore
f mat n about the change n p t n metabo m
b m l pat nts Th crr lat n of the tr g n
bala ce pat ts a l t s ith the u i r y
e c t f 17 k t t i l t n k l s i tanc
g ad t p a d est g n w u f tak n l t
a f u d th t nly ra ly d burn l pat nts h
a des ef m th n minimum qua ttes f food
Th 23 p t t ble to consum a l i t sl ghtly
bo eth r b s c l ier quir n t but frequ ntly
h larg r q ntit s f food w r gven u
mit ng d rth l mental c f s r es l t l

These sympt m su lly ce t r d n the
f rst e k Th y oc l eg rll s f th ty f
fool but w r most p ed i tients r ce v k
vnth c l et by t b Wheth r the sympt m
w p oduced by ces mou t fam no ac l
cal nes r ter is t k n Somet mes thes
pat ents om ted enough t lower mat r l l thes
caloric and n trog n i tak a crum ta c th t
e ces t ted r n f th det l r th s r a
so s the p tem earl by lrat n lca l c intak f
th pat ts espec l l th se h lal f re l f l
was not as co tant a l i red

All f the pati t e c ted ab rm lly l r g qu n
t t es f l e th rine L c p t f wh
rece ed ab mally l ge qu n t t s f p te n l
ca bohydrate all w r an negati n trog n bal ce
The gat ve b l c a usu lly m t p n l
d r i g th f rst t n days a d gradualy deer a l
th f t r Th pat ents who we inpr n ce l e
gat en troge b l a l tw ght an l some became
bly emacated Th n trog n l f t d i n t
flect the ch ges i w ght a l a l u l a t f l ta
pr t n m t bol sm i th 23 i t ent is g i

Alth h t was poss'bl by mea of a h gh calorico a d p otein intak to pr ente ces ivel s of n trog and w ight the cl cal co rs f th p t ts seemed t lea l tld b t that fo ced feed g w th the type of d et emplo ed s u des rable at least d ring the f rst ten d ys aft injury

It was cons d ed that most burned p t ts if llowed t eat l what th y des re do not co ume a ad qu t d t Hence t is important aft r the sh k phas f the jury h s pas ed to ist that th y eats f ficient food t mainta n proper trition

STEFUR. A. Zi u. MD

K nt G T nd D f nd rf H W A Clinical Study f Sensitivity t S lfathiaz l Am J M S 945 09 64

Unt was d re ct n t ulfo am d drugs may be class fied as follows () d et c t ffects such as m tin and cva () mecha cal effects d to p ec pita n th urin ry pas ages (3) all gic react o s—hyp rsensitivity s ch a drug fe nd erupt o s

Th authors study was m de with a r w to d t r m i g the t me f app ce of certa ller gic re ctio s upon primary dm tration f the sulfath az le as w ll as th incidence a d t m f o s t fall g c eact o ft r the re dm s tration f lf th l

P m y admi t ion Of 472 pati ts who recei ed i course of sulfathazole i h b t ed some form f react o v au ca a d m t g 5 per c t dru f er n 805 per ce t sk rash n 07 p c t rythema dosum co ju c t ts all compl cat a mia le cope ia leucocyt s delirium rthralgi a d so ess of the balls f th feet Forty r p t n ts less tha e half f th gr p exhibited react s whch had to be c s d red as due to ens t vity and f these 33 had dru fe r The fev r occurred betwee the first a d th l e th days with sharp peak f i c de ce on th ninth d y

R dm t at One hundred a d th r e p ti n ts d sulfathazol n two c asion The int rval b twee the two c urses w s from t to one hund ed d e ghty days Of these pati n ts 2 exhibited n t ty react All who d l p d drug fe react ns n th first adm istrat of sulf th zol aga d eloped dru fe w th two d vs ft dm istratio The total c de ce of dru fe was more than twice that whch curred n the g p f p t i e t wh had ec ved b t i c urses f treatment The sh rtene d period f t me n whchs ere dru f appea ed (the eco d day f readm tratio) po: t s t w rd sens tizat No uch se s t zati n w manifest upo administra t n unless n n days had el psed f om the beginning of the first co rse f t eatm t S gle t tal dos ge had n influence n the m de ce f eact on

The data presented by th thors tro gly s p port the thes ad a ced by Lon cope that there lere c react o s bel g i th sam lass with rum s kness

The c a ed number f ind viduals wh w re sens t o r dmistrat n th cl p p e a r e of dru f e nd the minim l interval of d a s necessary for its d el pment are pres nted as i d cat that se s t zati n is produc d by the it al d se f sulfath az l

ARTHUR J LESSER MD

Bl ck Sch ff r B Th P th l ogy f A phyl si Du t Sulf n mid Drug Ach Paik Ca 94 39 3

Th u ersal use of s lf am de c mpo ds a l the disco ery th they may act s a t gens capabl of elu ct g fat l react o h e f r the first tim m de pos bl the study f l r g mber f rela tively sl w but fatal anaphyl ct c actio s F e cases fa aphyl ct ed ath follow g th therap ut c use of s lf o m de c m p nds re p ented ths report as ell s an t est i g a d compre h e resum e n th theory of n phylact c bock Em phas s pl ed up th f ct that alle g c react can be l cited by pr t n drugs

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SAMUEL J FOG LSO MD

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SURGICAL PATHOLOGY AND DIAGNOSIS

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The hospital had a Burn Committee consisting of the surgeon, four physicians, a pediatrician, two pathologists and adjacent members in various specialties. This committee had a typed-out plan for the definite treatment of each burn, as might be suggested, and as a result every burn was uniformly treated. This plan closely followed the so-called "orthodox" method employed at the Massachusetts General Hospital. However, at the time of the Cocaine Glue Distaste Committee intra-nous morphine intranasal oxygen if necessary, clinical evaluation of impedance shock and absolute priority treatment of the patient with plasma in adequate quantity as determined by frequently repeated laboratory checks, no clean, good, clean, minimum of the local injury, simple protective preparation, dressings, the previously prepared sterilized case in the presence of the dry gauze smoothly applied, the addition of the rithme hems, the Ace bandages. Folded newspaper plants were applied to the extremities with the second Ace bandage fastened to the newspaper plants. Every patient is provided

received intravenous sodium sulfadiazine. Since the mid-1950s continued after the hospital with the National Research Council made an outright gift of 220,000,000 units of penicillin for both the therapeutic and prophylactic use.

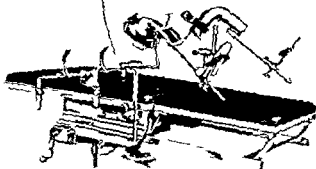
It is emphasized that during the first forty-eight hours burns are a problem in physiological chemistry and pathology. The only necessary surgical procedure in severe lacerations burns is to protect the wound from infection and further trauma. The emergency is a local treatment of shock, the important therapeutic problem and not the massive catastrophes, emotional shock superimposed on traumatic shock. With the minimum of casualties, the institution was instituted in the area of psychological evaluation and treatment, and taken a number of cases. The local unit were treated by application of a blood transfusion, a massive mobilization, and a delay in skin grafting of the third-degree cases. As a global medical patient, at the Hospital for the treatment of shock, all of the burned patients died. J. I. L. Q. M.D.

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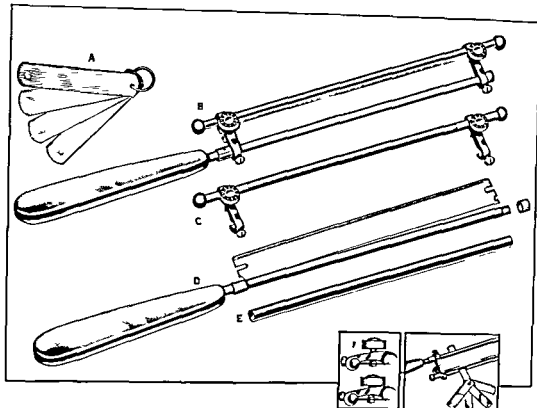
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Now Offered with Detachable Blade and Thickness Gauges
Modified Blair Brown Skin Grafting Knife with Marks Thickness Determining Attachment

At the suggestion of many users the new Blair Brown Skin Grafting Knife is now offered with detachable blade and the Marks Thickness Determining Attachment is now furnished with it. The copper plate gauges for accurately regulating the thickness of the desired skin graft from 6 to 36 thousandths of an inch in 2 thousandths inch step. In using the gauges are placed between the knife edge and the threaded grip rod. When in illustration "H" below. The knurled thumb screw at both ends of the Marks Attachment then are adjusted until the space between the grip rod and knife edge provides a light tension on the gauges.

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SURGERY

GYNECOLOGY AND OBSTETRICS

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NUMBER 6

SEGMENTAL RESECTION OF LESIONS OCCURRING IN THE LEFT HALF OF THE COLON WITH PRIMARY END TO END ASEPTIC ANASTOMOSIS

Report Based on Fifty Cases

JOHN M. WAUGH, M.D., F.A.C.S., and MONFORD D. CUSTER, Jr., M.D., Rochester, Minnesota

RADICAL cure of malignant lesions and other serious surgical disease of the colon dates in large measure from a report of the first exteriorization operation performed in 1893 by F. T. Laul in Liverpool, England. This procedure later to become more generally known as the Mikulicz operation provides a moderately radical curative technique which can be performed in the most expert hands with a mortality rate which has been reported in recent literature as ranging from a low of 4.8 per cent (Woolf) to a high of 99 per cent (Gibson and Hodoe). Other figures include Cheever 19.7 per cent, MacFee 27.9 per cent, and Nordmann 28 per cent. Babcock and Bacon (2, 3) in discussing this operation in 1943 ascribed to it a mortality rate of 16.6 per cent. However, with the advent of chemotherapy including the use of succinyl sulfathiazole (sulfasuxidine) in the preparation of the bowel, there is little doubt that this mortality rate can be and has been revised downward so that a figure somewhere be-

tween 5 and 10 per cent probably more nearly approaches the correct one.

Developing concurrently with the foregoing method, there has been another type of resection consisting of a somewhat more radical removal of the lesion with immediate restoration of the continuity of the bowel by means of primary anastomosis. The first successful operation of this type was performed by Kohler in 1881. The Johns Hopkins School has contributed materially to the development of this type of one stage procedure. Beginning in 1910 with the introduction of the aseptic anastomosis by Halsted, it continued with the report by Miller in 1923 of additional cases in which this method was used and led up to the recent excellent work of Stone and McLanehan. In December 1942 these authors reported data on 104 cases of resection for carcinoma in various locations in the colon with primary aseptic anastomosis and in most instances without proximal colostomy. Of the 104 patients, 11 died; thus the mortality rate was only 10.6 per cent. Others who have reported preference for one stage primary anastomosis over extraperitoneal resection included Lockhart Mummery, Allen Chee-

From the Division of Surgery, Mayo Clinic, and the Mayo
Foster Laboratories, with the assistance of the Mayo
Clinic Laboratories, Rochester, Minnesota.

ver Joll Gibbon and Hodoe Mayo and his co workers (16 17) MacFee and Woolf

A somewhat analogous situation has developed in recent years in regard to the surgical treatment of those lesions of the lower part of the sigmoid the rectosigmoid and the upper part of the rectum which are so distally located as to preclude radical removal by exteriorization. Since the introduction of the Miles operation in 1910 these lesions have been effectively treated by combined abdominoperineal resection or by the less radical posterior resection in one or two stages. Effective though these procedures may be they both entail sacrifice of the rectum and sphincter and with the placing of permanent reliance on an abdominal sacral or perineal colonic stoma. Supported by the pathologic evidence furnished by Gilchrist and David and further extended by unpublished work of Glover that curable malignant lesions of the lower part of the large bowel seldom if ever metastasize in a retrograde manner various surgeons have contrived procedures designed both to cure the disease and to preserve the sphincter. The most substantial proponents of this more conservative type of operation have been Babcock and Bacon (2 3) who have developed a modified abdominoperineal resection and Dixon who has recently described in detail his method of anterior resection.

For several years resection of the right half of the colon has been followed on the service of one of us (J M W) by immediate end to end aseptic ileocolostomy with very satisfactory results. Within the past 15 months we have applied the identical technique of aseptic anastomosis over a three bladed (Rankin) clamp in restoring continuity of the bowel after resection of lesion located variously between the midtransverse colon and the upper part of the rectum inclusive. This report deals with the first 50 cases of this type of resection. We are decidedly in favor of this type of resection in the great majority of instances.

The oldest patient was 78 years and the youngest 15 years of age. The average age of the patients was 55.5 years. The age range is the customary one for a group composed mainly of patients suffering from malignant lesions. The types of pathology change en-

countered were carcinoma 43 benign tumor (lipoma) 1 localized megalosigmoid tubo-ovarian abscess with involvement of sigmoid 1 diverticulitis 1 benign stricture (post radiation) 1 incarceration in ventral hernia 1—a total of 50.

LOCATION OF LESIONS

By virtue of the location of the lesions in the colon we have classified the cases as follows. Group A comprises those cases in which the lesions otherwise would have been removed by extraperitoneal resection. Group B comprises those cases in which the lesion otherwise would have been removed by combined abdominoperineal resection (Fig 1). The term rectosigmoid requires further definition since several of the standard text books of anatomy make no use of this designation. By rectosigmoid we refer to the segment of the bowel 3 to 4 centimeters long at which the lower part of the sigmoid joins the upper part of the rectum and which is situated at or immediately above the peritoneal reflection.

PREOPERATIVE PREPARATION

Preoperative preparation of the bowel is of especial importance since it is our considered opinion that primary anastomosis should be performed only in those cases in which thorough decompression has preceded the operation. It has been a welcome surprise to find a very small proportion of the cases unsuitable for this operation. Credit belongs to the medical and nursing personnel of the medical colon service who have supervised the preparation of most of these patients for surgical treatment.

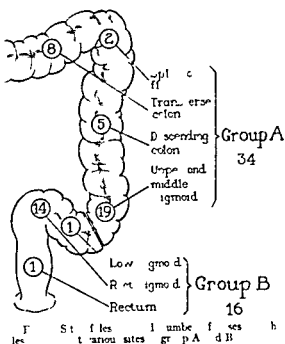
The important features of this preparation consist of (1) subsistence of the patient on a residue free diet for 3 to 4 days prior to operation (2) oral administration of sodium phosphate (3) repeated irrigations of the colon (4) rectal aspirations combined with the administration of camphorated tincture of opium (paregoric) for 24 hours immediately preceding operation and (5) the oral ingestion of succinylsulfathiazole in the amount of 2.0 grams 5 times a day preferably for the entire 4 day period of preparation.

TECHNIQUE OF OPERATION

Group A For lesions situated in the mid portion of the sigmoid or above the bowel is resected widely above and below the lesion and a correspondingly wide wedge shaped segment of the mesentery is excised with it. The anastomosis is then effected over a three bladed crushing clamp (Rankin) using one row of No 6 chromicized catgut reinforced by a second row of interrupted sutures of No silk. The mesentery is then reapproximated and the posterior and lateral peritoneal reflections are resutured. The incision itself is then closed usually without drainage.

Two technical advantages of this method over extraperitoneal resection are at once apparent. First the bowel may be resected more widely since no portion of it is advanced to the anterior abdominal wall. Thus local recurrence and particularly recurrence in the scar of the incision (a fairly frequent complication following exteriorization) are minimized. Second and also for the reason that the bowel is not brought forward the node bearing mesentery may be resected more widely and approximation of the mesenteries is facilitated a step which prevents internal herniation. Nodal involvement incidentally was discovered in approximately half of the cases of carcinoma (21 of 43 cases).

Group B For lesions situated in the lower part of the sigmoid the rectosigmoid or the upper part of the rectum the technique closely follows that of anterior resection described by Dixon. The bowel is first mobilized and devascularized in exactly the manner that is customary in performing one stage combined abdominoperineal resection. After ligation of the superior hemorrhoidal artery the bowel is manually freed posteriorly from the hollow of the sacrum and if the patient is male anteriorly from the prostate gland. This is an important stage of the procedure since it is here that the surgeon must pause to decide whether he is to proceed with abdominoperineal resection or whether the growth has been mobilized high enough to allow segmental resection with anastomosis. In our experience lesions of the rectosigmoid are almost invariably resectable by the latter method and lesions high in the rectum itself



occasionally so. In 1 instance open anastomosis was performed while in the remaining 16 cases the aseptic technique described previously was employed.

Colostomy. Protection of the suture line by proximal colostomy has been advocated by Dixon, Rankin, Woolf and others. Stone and McLanahan found it unnecessary in the majority of cases the exceptions being those instances in which obstruction was present.

In our series prophylactic colostomy was felt to be unnecessary. In 4 cases previously established colonic stomas were present and were of course left open and functioning until convalescence from the resection was complete. Three of these colonic stomas had been established as emergency decompressive measures and the fourth had resulted from the exteriorization of one of two distinct and widely separated malignant lesions occurring within the same bowel.

There is little question in our minds that colostomy is an unnecessary addition to resection performed for lesions of the sigmoid or above. However our feeling in regard to its use following resection of lower lying lesions is not so definite. We have found that there is some tendency to the development of

edema in and about an anastomosis which is performed after resection in those cases in which the bowel has been freed extensively from the hollow of the sacrum. This we feel is the cause underlying a tendency to the development of temporary partial obstruction in the early postoperative period. In 3 cases in which operation has been performed since the completion of the series that we are reporting this difficulty has been obviated by passing a tube through the rectum and beyond the anastomosis. This tube has been left in place for from 7 to 10 days and has thus far been effective in eliminating obstructive phenomena. It is our intention to employ this tube in the future in all cases of resection of the lower part of the sigmoid and below. In this way we hope to omit successfully the addition of colostomy to the operation performed for group B as well as group A lesions.

POSTOPERATIVE MANAGEMENT

At the conclusion of the operation and before the patient is removed from the operating room the rectum is thoroughly dilated so as to admit three or four fingers. Other means of ensuring patency of the lower part of the bowel such as the insertion of a rectal spool were used in some of the early cases. They were found to be unnecessary. Patients expelled flatus spontaneously within 48 to 60 hours after operation and the bowel ordinarily functions quite normally thenceforward. Patients on whom sigmoidoproctostomy has been performed frequently experience mild diarrhea which ordinarily subsides within a few weeks.

Administration of succinylsulfathiazole in full doses is resumed as soon as the patient is able to take it by mouth. This may be on the day of operation if the operation has been performed with the patient under spinal anesthesia; otherwise it is withheld until the second or third postoperative day. Enough water is allowed with each dose to enable the patient to swallow the tablets. Other fluids are withheld until flatus is freely expelled. Residue free liquids and solids are then employed and continued for the first week of feeding. They are then succeeded by a low residue diet. The amount of food increased

daily so that at the time of dismissal from the hospital (usually on the fourteenth postoperative day) the patient is instructed in a very adequate maintenance type of low residue intake. He is advised to follow this diet in a general way for 2 months and then to liberalize it.

MORTALITY RATE

Two of the 50 patients died, giving a mortality rate for this series of 4.0 per cent. One of these died of atelectasis and extensive bronchopneumonia which occurred on the fifth postoperative day and failed to respond to usual measures including parenteral administration of sulfadiazine sodium in adequate amounts. At necropsy the anastomosis (in the rectosigmoid) was found to be in excellent condition. In the other case in which the patient was an elderly woman a fecal fistula developed as well as an associated retroperitoneal abscess which drained inadequately through a stab wound which had been established in the left flank. Her convalescence was prolonged and at several intervals we thought that she was on her way to recovery. Two weeks preceding her death the fistula closed and subsequently her bowels moved normally through the rectum. However as the result of the combination of inadequate drainage of the abscess with extensive cardiovascular disease and a terminal pulmonary embolus this patient succumbed on her forty-ninth postoperative day.

The mortality rate for the two groups A and B is .9 per cent and 6.3 per cent respectively. The higher risk associated with the lower group of lesions is probably a real one because of the more extensive procedure involved. However the mortality rate of 6.3 per cent compares favorably with that of Collier and Ransom (8.9 per cent) and Fansler (5.2 per cent) which occurred in the abdominoperineal resections and preservation of the rectum and sphincter was still accomplished.

PALLIATION

In 6 cases hepatic metastasis or nodal involvement beyond the limits of resectability was present and resection was considered a frankly palliative procedure. We feel that the

indication for primary anastomosis is if any thing more certain in such a situation than in dealing with curable disease since these patients are spared the burden of colostomy life during their remaining months

HOSPITALIZATION

Thirty of the 48 patients who survived the operation underwent primary healing and were dismissed from the hospital on the fourteenth postoperative day. The average period of hospitalization for the entire group was 21.4 days. Further analysis of the latter figure however reveals a decided difference in the stay in the hospital between the two groups A and B. Whereas twenty-five (74 per cent) of the 34 patients of group A left the hospital within 2 weeks only 5 (31 per cent) of the 16 patients of group B were able to do so. The same tendency for a more protracted convalescence in group B than in group A is evidenced by the average hospitalization times which were found to be 30.1 days and 19.4 days respectively. This discrepancy is related to and dependent on the development of perianastomotic edema and a localized type of cellulitis in the anterior sacral space. In those cases in which the bowel has been freed from the hollow of the sacrum there is protracted low grade fever and the patients are fairly often annoyed by the frequent discharge of irritating semiliquid stool. The local edema and inflammation subside however over a period of weeks or months. Only 3 of our patients mentioned a persistence of symptoms when last heard from. It may be that this tendency toward inflammation about the anastomosis will be obviated by the use of the rectal tube as described previously or by establishment of a temporary proximal colonic stoma as advocated by Dixon.

COMPLICATIONS

Complications of varying degrees of severity developed in 10 of the 48 cases in which patients survived. Fecal fistulas developed in 3 instances all closed spontaneously. 2 in 3 weeks and 1 in 6 weeks. In 3 other cases all from group B an abscess anterior to the sacrum developed. This abscess drained through the rectum. This complication led to a pro-

longed period of hospitalization but ended with complete recovery in 2 of the cases. In the third case the abscess was draining extensively from the rectum when the patient was last heard from. In one case in which a portion of the sigmoid which had been involved by a large tubo-ovarian abscess had been resected extensive edema of the anastomosis developed. We feel that the edema was related to the original infection. This likewise necessitated a prolonged (77 day) convalescence during which period the patient suffered considerably from cramping abdominal pain and had a persistent fever. However when recently heard from she had undergone substantial improvement although her cramping pain has not as yet entirely subsided. One patient required reoperation on the tenth postoperative day. This was necessitated by the development of a mechanical obstruction of the small intestine which we found to be due to an adhesive band at the site of a former appendiceal abscess. Infection of the incision occurred in one case. We relate this low incidence to the preparation of the bowel with sulfasuxidine and to the use of an aseptic anastomosis. The final complication was a nonfatal pulmonary embolus. The patient was a middle aged man for whom palliative resection had been performed. The development of prolonged urinary retention a familiar complication following combined abdominoperineal resection was conspicuous by its absence.

SUMMARY AND CONCLUSIONS

Primary aseptic anastomosis was performed in 50 consecutive cases after resection of lesions of the left half of the colon. Two patients died giving a mortality rate of 4.0 per cent.

For lesions of the middle part of the sigmoid and above this operation provides a safe curative one stage procedure. The hospital convalescence from which seldom exceeds 3 weeks. This period compares favorably with the minimum of 8 weeks close supervision and the 3 or 4 separate procedures involved in extraperitoneal resection.

For lesions of the lower part of the sigmoid the recto sigmoid and the upper part of the

rectum this technique provides for the eradication of malignant lesions with preservation of the lower part of the rectum and the sphincter ani. The average period of hospital convalescence from this operation (anterior resection) is approximately 1 month.

1. Preparation with a sulfinyl ulfathiazole and aseptic anastomosis are factors in reducing the mortality rate.

2. Primary anastomosis is the procedure of choice following resection of lesions in the nonobstructed bowel.

3. Proximal colotomy is unnecessary for lesions of the middle part of the sigmoid or above.

4. Proximal colotomy or prophylactic decompression with a rectal tube is indicated when lesions of the lower part of the sigmoid or below are removed.

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PENICILLIN THERAPY IN ABDOMINAL SURGERY

The Results of Prophylactic and Therapeutic Use in Fifty Cases

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THE objective of this report is to point out a limited but definite field of usefulness for penicillin in the prevention and treatment of abdominal sepsis

Penicillin has not been generally accepted as an effective agent in the treatment of infected surgical conditions of the abdomen. This conclusion is due in part to the few brief and unfavorable reports of its use in peritonitis. Lyons in his summary of cases treated in various United States Army Hospitals states

Infections arising as complications of appendicitis have not been responsive to treatment although one patient showed improvement coincident with treatment. It seems however that in the few cases reported patients were treated late in the disease at a time when the infection was widespread and the prognosis poor. Jeffrey in his discussion of the use of penicillin in the British Army remarks that

Penicillin is usually not of value in penetrating wounds of the abdomen; most of the deaths in such instances are due to physiological causes. In addition, cultures of the infections although frequently mixed usually show a predominant growth of gram negative bacteria which are not sensitive to penicillin. These nonsensitive organisms also produce penicillinase which inactivates penicillin (Abraham and Chain)

We administered parenteral penicillin to 50 patients critically ill with generalized peritonitis. These patients presented the usual picture of terminal peritonitis with such complications as multiple intraperitoneal abscesses, paralytic ileus, hepatitis, pneumonia and kidney damage. Treatment was started late and was discontinued after a few days because of scarcity of material. All of these patients died. The only indication that penicillin exerted any favorable effect in these patients was evidenced in the temperature graphs. There was a definite reduction of temperature

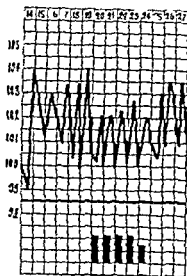
very closely associated with the initiation of penicillin therapy in every instance (Figs. 1 and 2). Because cultures of infected material from these patients contained both sensitive and insensitive organisms, this temperature reduction was attributed to some inhibition of those organisms which were sensitive.

In many open infected wounds of the extremities, numerous species of bacteria were isolated from cultures and as in peritonitis the insensitive bacteria were often more prolific. It was found that when the sensitive organisms in these wounds were controlled by means of penicillin, healing did not appear to be impeded by the continued presence of the insensitive bacteria. In peritonitis streptococci or staphylococci can often be isolated along with *Escherichia coli*. These penicillin sensitive bacteria may easily be overlooked in cultures due to the rapid overgrowth of insensitive organisms. Ladd and Gross frequently found a mixture of organisms in peritoneal cultures and it is their opinion that the bacteriology in cases with abscess or peritonitis is variable. In many such peritoneal cultures there are doubtless important organisms which are lost sight of when there is a luxuriant overgrowth of colon bacillus.

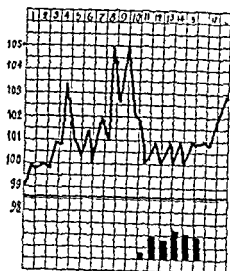
In view of the pathogenicity of gram positive organisms in other infections we believe that these penicillin sensitive organisms play a greater rôle in mixed infections of the abdomen than is commonly attributed to them. Certainly the inhibition of these organisms early before the infection has become widespread should be a factor in the recovery of certain patients.

THE EARLY USE OF PENICILLIN IN PERITONITIS

Twelve additional patients with peritonitis were treated more adequately than were the eleven in the first cases mentioned. Treatment in the majority of these cases was initiated at the



F Staphylococcus aureus and unidentified gram-negative bacilli. Temperature treated with penicillin 100,000 units daily.



F Staphylococcus aureus and Escherichia coli. Temperature treated with penicillin 100,000 units daily.

time of operation. Seven received local treatment and parenteral therapy, 5 received parenteral therapy only. Local administration in 3 instances consisted of instilling 50,000 units and in 4 other cases 100,000 units of penicillin into the abdominal cavity by means of a catheter just prior to closure. This penicillin was diluted with 30 to 50 cubic centimeters of normal saline. Parenteral therapy was administered intramuscularly at 3-hour intervals. Dosage was varied from 10,000 units to 100,000 units every 3 hours, totaling 80,000 to 160,000 units every 4 hours. The duration of treatment was quite variable. In 3 instances there was evidence of reactivation of infection after penicillin had been discontinued and an additional course was administered.

These patients also received all other accepted therapeutic measures. Oxygen was administered, the electrolytic caloric protein and fluid balances were maintained, distention was combated by continuous gastric suction and the maximum benefit of sulfonamide therapy was obtained. (Because of the serious nature of the infection in these patients we did not feel justified in evaluating penicillin without sulfonamide administration.)

The high and low daily variations of temperature are only as recorded. Penicillin was given 100,000 units to the square flaccid abdominal wall every 4 hours.

The usual numerous laboratory determinations were made but only the significant or unusual results are included in the following summaries.

CASE 1. Male aged 33 years, admitted with a history of having been operated upon because of a ruptured Meckel's diverticulum 5 years previously. Temperature 101.2 degrees, pulse 120. The abdomen was moderately distended. Tenderness marked over a scar on the lower midabdomen. The right firm mass palpable beneath the scar. There had been no evacuation since onset of flatulence 48 hours. A diagnosis of a carcinoma of the colon was made.

At operation a large inflammatory mass was found in the sigmoid colon. There was a cyst of a perforated diverticulitis with a loculation containing a thick, creamy pus. The colon was resected and the peritoneal cavity was irrigated. The bowel was exteriorized by a Mikulicz procedure.

After operation the temperature elevated to 101.2 degrees, he was critically ill. Penicillin was started on the 5th postoperative day.

This patient received adequate sulfonamide therapy prior to administration of penicillin. No other changes in treatment were made at the time of penicillin administration.

CASE 2. Female aged 36 years, 5 months gestation, admitted with the multiple generalized convulsions. The patient was given 100,000 units of penicillin daily.

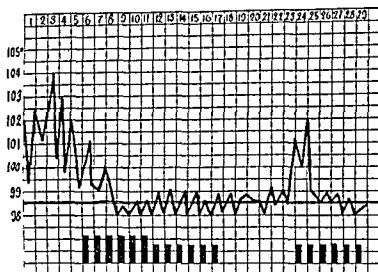


Fig 3 Case II m lytic Staphylococcus e d Esch rich a coli

m n Temperat e was 101.8 d gree p l e 120
The abdomen v i d a d tender thr ough ut no
f al heart tones were a d b l The r v ot
d lated and there was no vag al b l d g Th
white blood co t was 7 900 61 pe cent tr ph ls
She del d sponta usly s dd ly hours
after adm s n f l low g delivery all bd minal
s gns persisted and a dagnos s f periton t s was
made

At operati n a gang eno s perf rat i pp div
was f alani removed O r r 1000 c bic c t me
t r s f seropu was aspirated fr m th abd m n
Pen cill n was a l m stere i l calv (1000 ts)
and continu d par tially

In Case 2 sulfadiazine and penicillin were
administered concomitantly and therefore
evaluation of penicillin effect was difficult
However during the second febrile period sul

fadiazine was administered for a period of 6
days with little improvement Then a se
cond course of penicillin was apparently res
ponsible for immediate temperature reduc
tion and general improvement (Fig 4)

Case 3 Female aged 23 years was admitted
with c mpla nts f nausea duration 4 days and
l w r right q adrant abd minal pain duration 3
l y s n et g adual Temperature rose to 104.4 de
grees p lse as 126 Th pat ent was exhausted
ha i g travelled the 5 d y s prior to admission Sh
w ch lling everly

A dagn sis of a perforated append x was ma le
and this d agnosis was confirmed at operati n Th
append x was rem ved a d fla k dra nage as in
stituted

Pneumonitis d veloped on the nd postoperati e
day There was no impr m nt from sulfadiazine

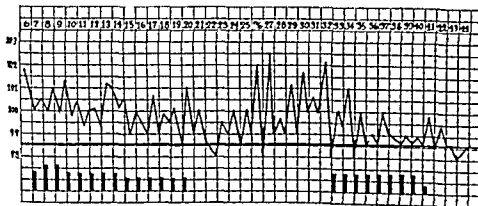


Fig 4 Case I Staphylococcus reu nd Esch rich coli

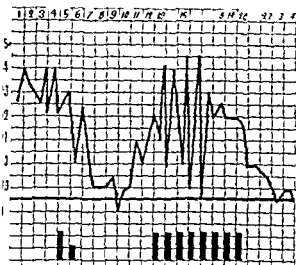


Fig 3 Case 3. An abscess of the psoas muscle.

th rapy. P. cillin th rapy was start d on the fourth post operat e day but only cont n ed 2 days. Improveme t e med clo ly a c t d with the adm nistrat e f the dru. St t ng the 10th po t operat e d v the temperatur agn gradu lly le vat d d impro d dra na e w s establ h d w th little chan e. P. cill w s gan adm: ister d.

In Case 3, penicillin was administered for only 4 days on the first occasion. It is questionable if treatment over this short period of time was responsible for the marked improvement (Fig 3). The second rise in temperature was associated with abscess formation drainage of which did not appreciably alter the patient's condition. The administration of penicillin at this time produced marked general improvement although there was no temperature reduction for a period of 3 days.

CASE 4. Male aged 29 yrs was admitted with acute abdominal pain, sudden onset, duration 4 hours. Temperature was 101.5 degrees F. Tenderness and rigidity were present throughout the abdomen. The patient was in the right lateral position.

A diagnosis of a perforated appendix with generalized peritonitis was confirmed at operation. The appendix was removed, the resection was satisfactory.

The postoperative course was not satisfactory. The temperature elevated to 102 degrees F. The abdomen remained moderately distended. On the 4th postoperative day, the patient complained of discomfort in the right lower back. The chest radiograph showed a wedge-shaped opacity in the right lower lung field.

At this distress, a ray film of the chest demonstrated a wedge-shaped opacity in the right lower lung field. The right diaphragm was elevated. The pleural effusion was reported. The pleural fluid was bloody and contained about 15 milligrams per cent. The temperature remained elevated and the general condition of the patient was deteriorating.

On the 12th postoperative day, postoperative chest radiograph showed a wedge-shaped opacity in the right lower lung field. The right diaphragm was elevated. The pleural effusion was reported. The pleural fluid was bloody and contained about 15 milligrams per cent. The temperature remained elevated and the general condition of the patient was deteriorating. On the 17th postoperative day, the patient was discharged.

In Case 4, signs of a progressive subdiaphragmatic abscess disappeared during 4 days administration of penicillin. Nevertheless, the temperature continued to rise and the signs of pleural effusion increased although the patient was receiving 160,000 units of penicillin daily. The pleural infection was not controlled until penicillin was administered directly into the pleural cavity. The isolation of the same organism from three different sites leaves little doubt as to the pathogenesis of the pleural infection.

CASE 5. Male aged 30 yrs was admitted on the 6th day following appendectomy. The patient had a persistent fever. The temperature was 101.5 degrees F. The patient was in the right lateral position. The chest radiograph showed a wedge-shaped opacity in the right lower lung field. The pleural effusion was reported. The pleural fluid was bloody and contained about 15 milligrams per cent. The temperature remained elevated and the general condition of the patient was deteriorating.

On the 12th postoperative day, the patient was discharged. The temperature remained elevated and the general condition of the patient was deteriorating. The pleural effusion was reported. The pleural fluid was bloody and contained about 15 milligrams per cent. The temperature remained elevated and the general condition of the patient was deteriorating.

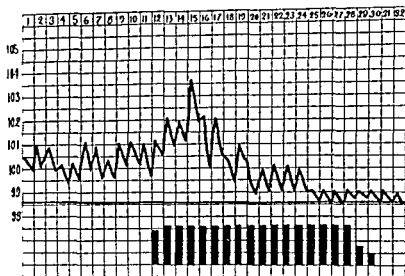


Fig 6 Case 4. A patient with fulminant Staphylococcus aureus culture from the abdominal wound.

although the temperature remained elevated for a short time, it rapidly declined. He was allowed up on the 9th day for treatment and recovery was uneventful thereafter.

This patient showed no improvement following chest aspiration and no reformation of fluid. It was believed that the pleural effusion had little bearing on the course. There was no change in treatment and no pus was evacuated from any other site. Probably a subdiaphragmatic infection was aborted by penicillin.

CASE 6 Male aged 3 years developed a retrocecal abscess on the 6th day following appendectomy. There were associated signs of generalized peritoneal irritation. The abscess was drained but no improvement resulted. Abdominal tenderness and rigidity increased and perilytic abscess developed. The temperature rose to 104°F. Full drainage of the abscess was obtained. Penicillin was administered. The abdominal signs gradually decreased. The abscessable drained completely. The patient appeared to do well. There was an abrupt fall.

The infection in this patient was progressive in the face of all other therapeutic measures. Arrest of extension of the infection was closely associated with the initiation of penicillin therapy.

CASE 7 Male aged 34 years with postoperative ileus. He attacked with diarrhea which persisted. He was admitted to the hospital 25 days later. At that time he had a dehydrated abdomen with moderate tenderness. The pulse rate was 110 bpm. The temperature was 101°F. The patient was given penicillin and the temperature fell to 98°F. The pulse rate fell to 80 bpm. The patient was discharged on the 32nd day.

On the 12th day of hospitalization, following a proctocopic examination, he suddenly developed severe generalized abdominal pain. He was transferred to the general surgical ward with a temperature of 96 degrees, pulse 60, respirations 4, and blood pressure 90/60. He received emergency shock treatment. Examination revealed the abdomen to be markedly distended and rigid and the liver to be enlarged to the level of the umbilicus. He appeared to have generalized peritonitis.

He was operated upon the day of admission. About 3,000 c.c. of cloudy fluid was

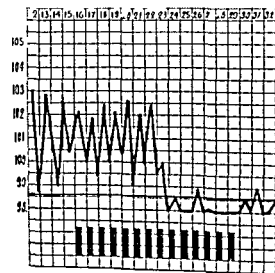


Fig 7 Case 5. Hemolytic Staphylococcus aureus cultured from the drainage of abdominal wound.

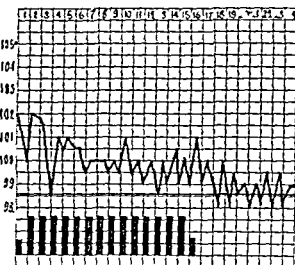


Fig 8. Case 8. Staphylococcus aureus and Escherichia coli.

purated from the abdomen. There was marked peritoneal exudate. Operative exploration of the intestine demonstrated no perforation. The dome of the right lobe of the liver was fluctuant and a collection of purulent exudate was noted in this area. Peritonitis produced thick pus. Apparently spontaneous drainage of a liver abscess had occurred. A mushroom catheter was inserted through the lateral chest wall into the abscess cavity. No chocolate pus cysts were found in the vacuolated material. Cultures of peritoneal and abscess material showed no growth.

Penicillin was administered locally (10,000 units) and continued parenterally. Treatment was discontinued on the fifth postoperative day because of negative cultures and the fact that the patient's temperature was normal.

His general condition was poor. He eventually developed testicular abscesses requiring percutaneous drainage on two occasions.

Two months postoperatively he developed pleural effusion and related temperature. On paracentesis a bloody fluid was obtained. Penicillin and thoracic pleural cavity were treated further accumulation of this fluid. Hemolytic streptococci were cultured from the aspirated material and was also cultured from the drain site abscess.

Blood sent to the laboratory in Washington for examination was reported as showing positive complement fixation for malarial parasites and metacarpal disease was highly impure. It was eventually transferred to a hospital for further examination.

It was concluded that low improvement in this patient was probably due to extensive liver damage. Penicillin was effective in aborting malarial infection in this patient.

CASE 8. Male aged 22 years 5 days prior to admission developed cramping abdominal pain which increased in severity. On the third day of illness his complaint increased he became nauseated and vomited frequently. He was admitted to a hospital and directed conservatively for a small bowel obstruction. There was no improvement.

He was operated upon 48 hours after transfer. Three black gangrenous loops of ileum were found which the abdomen was opened. The obstructed and transected were secondary adhesions at the site of an old appendectomy. Considerable fluid present and there was leakage of intestinal content. The gangrenous bowel was removed and a double-barrelled ileostomy was done. Penicillin was given locally (50,000 units) and continued parenterally.

The postoperative course in Case 8 was surprisingly satisfactory. The wound did not become infected. Due to the high location of the ileostomy, difficulty was encountered in maintaining his nutrition and in preventing skin erosion. Subsequently the ileostomy was closed and a transverse ileocolostomy was done. Recovery was satisfactory.

CASE 9. Male aged 17 years was undischarged in the hospital as a machine gun bullet was situated between the bladder and the sigmoid colon. The office of a drainage sinus tract which communicated with the ileum in the body was present in the right perineal region. He had partial obstruction of the anal canal.

He was being prepared for perianal operation by administration of penicillin parenterally as well as locally into the sinus tract. Hydroperitoneum was demonstrated in the tract before penicillin was instituted. On the occasion of following this irrigation he developed severe abdominal pain followed by increasing signs of peritonitis and intestinal obstruction.

At operation made peritoneal irritation was found the distal ileum was distended and the bowel wall was thick and edematous. One loop was fixed to the pelvis and formed the roof of an abscess in which the foramen body was imbedded. Thick pus was evacuated from the abscess and the bullet was removed. It was necessary to do a resection of about 12 inches of the damaged bowel. A double-barrelled ileostomy was done. At the end of the operation 100,000 units of penicillin were injected into the abdomen.

The patient was critically ill immediately following the operation but responded rapidly. Postoperative temperature was 101 degrees Fahrenheit on the first day and 100.5 degrees thereafter. There was no evidence of peritoneal irritation following the operation.

In Case 9 cultures from the sinus tract grew on various occasions diphtheroids, Staphylococcus aureus, streptococci, Bacillus proteus and proteus. The course of this patient was even more satisfactory than that in the

preceding case. It is reasonable to conclude that some inhibition of this mixed infection should be attributed to penicillin.

CASE 10. Female aged 22 years housewife was admitted complaining of constant generalized abdominal pain. The onset was sudden 2½ days prior to admission and was cramping in nature. Pain gradually localized to the right lower quadrant becoming somewhat relieved after 18 hours. It again increased in severity and became widespread.

Examination revealed moderate distention the abdomen was rigid. Pressure and rebound tenderness were marked throughout and somewhat accentuated on the right.

A diagnosis of acute appendicitis with possible perforation was confirmed at operation. A gangrenous perforated appendix was removed. Just prior to closure 100,000 units of penicillin were injected intraperitoneally. The abdomen was not drained. Penicillin was continued parenterally.

The temperature was 100 degrees on the occasion of the day following operation but did not go above 99 degrees thereafter. She was allowed up on the 2nd postoperative day and was discharged from the hospital on the 8th postoperative day.

It is interesting to note that the postoperative course in Case 10 was as uneventful as after the average interval appendectomy.

CASE 11. Male aged 65 years 10 days prior to admission developed sudden abdominal cramping. The following day he noted tenderness in the right lower abdomen. On admission the above complaints were still present and in addition he noted weakness and anorexia. Examination revealed a tender firm mass in the right lower quadrant.

A diagnosis of appendiceal abscess was confirmed at operation. In establishing drainage in the right flank considerable pus was spilled into the abdominal cavity. Smears showed gram positive cocci which were not identified and Escherichia coli. Cultures grew only the latter organism. Penicillin was applied locally (100,000 units) and continued parenterally.

The highest postoperative temperature was 100 degrees. It returned to normal on the 3rd postoperative day at which time the patient was allowed up. Recovery was uneventful though patient being discharged on the 16th day of hospitalization.

Spillage of pus into the peritoneal cavity during an attempt to drain an intra-abdominal abscess is an indication for both local and parenteral penicillin therapy even before culture reports can be made.

CASE 12. Female aged 3 years was admitted complaining of severe lower abdominal pain gradually in onset duration 3 days. She was not used to and constipated.

On examination there was found generalized tenderness more marked in the right lower quadrant. Pelvic examination was painful but no abnormality was palpated. Smears from the cervix revealed only occasional pus cells. There was definite rigidity and rebound tenderness referred to the right lower quadrant.

A diagnosis of perforated appendix with generalized peritonitis was confirmed at operation. The appendix was removed and 100,000 units of penicillin were injected into the abdominal cavity as the abdomen was closed. Cultures grew only Escherichia coli. Temperature was 102 degrees on the first postoperative day subsiding to 99 degrees by the end of the 2nd postoperative day. This patient was ambulant beginning the 4th postoperative day. The recovery of this patient was uneventful.

The postoperative course in 10 of the cases was unexpectedly mild. Of the 3 instances of pleural effusion 2 of which were infected none developed empyema.

Intraperitoneal local administration appears to be of value and there is no evidence to indicate that penicillin should not be administered by this route.

The cause and extent of peritonitis is so variable that a small series of cases such as reported here is insufficient to afford conclusive evidence as to the effectiveness of the drug in this disease. However the improvement which was so closely associated with the institution of penicillin therapy in these cases is presumptive evidence that penicillin was at least a factor in their recovery.

It is well known that penicillin is more effective than the sulfonamides in controlling the staphylococcus (Powell and Jameson, Robson and Scott and Fleming). Laboratory animals can be protected against intraperitoneal injections many times the minimum lethal dose of various organisms by penicillin as proved for hemolytic streptococci by Hobby, Meyer and Chaffee (5) and for sulfonamide resistant pneumococci by McEee and Rake and Robinson. In view of the frequency with which staphylococci were isolated from cultures in these cases and considering the pathogenicity of this organism in infections elsewhere it seems logical to conclude that penicillin is the drug of choice for combating this phase of the infection in peritonitis. The efficacy of penicillin in staphylococcal infections is of importance not because of a special sensitivity of

staphylococci but because of refractoriness of this type of infection to sulfonamide therapy Dawson and Hobby ()

No cases of primary peritonitis were encountered but considering the frequency with which susceptible organisms are the causative agent in this disease it is probable that here penicillin should be the chemotherapeutic agent of choice.

Effectiveness of penicillin therapy in these infections appears to be directly related to the duration of the infection. This clinical experience substantiates the very interesting recent experimental work of Fauley and associates. These naval officers produced peritonitis in dogs by ligating all blood supply to the appendix. (All animals that developed internal fecal fistulas were excluded.) One group received intramuscular penicillin within 1 hour following operation; the mortality was 0 per cent. The second group were treated after 1 hour; the mortality was 21 per cent. The third group received no penicillin; the mortality was 96 per cent.

PREOPERATIVE AND POSTOPERATIVE PROPHYLACTIC ADMINISTRATION

Twenty five patients with infected wounds received penicillin both preoperatively and postoperatively as a prophylactic measure. Eleven colostomies and 3 ileostomies were closed. Seven sinus tracts leading to foreign bodies and 4 intestinal fistulas were excised. Extensive surgical procedures were required in several instances. Hermal defects associated with enterostomies were repaired at the same operation.

Treatment consisted of parenteral administration of 10 000 units or 15 000 units every 3 hours intramuscularly for an average of 3 or 4 days preoperatively. Treatment was continued postoperatively until the patient had been afebrile for at least 3 or 4 days. The average duration of treatment was 11 days.

The postoperative course of these patients was very gratifying. The local reaction was minimal in these operative wounds. In no instance did a wound become infected or drain purulent material. The average postoperative course was milder than in similar patients operated upon at the same time and in prior

to the use of penicillin. One complication was encountered following the closure of a colostomy. On the 6th postoperative day this patient developed an elevation of temperature to 102 degrees and there were associated signs of peritoneal irritation. The dosage of penicillin was increased from 10 000 units to 20 000 units every 3 hours and sulfadiazine was administered intravenously. He improved rapidly and his subsequent course was uneventful. The drug which was responsible for the improvement could not be determined.

From this limited experience it is suggested that definitive operative procedures on contaminated wounds may be carried out earlier and with greater safety when penicillin is administered prophylactically.

POSTOPERATIVE TREATMENT OF INFECTED SURGICAL CONDITIONS

P. l. phil. 3.1.1

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remained between 104 and 105 degrees for 7 days and gradually reduced thereafter to 100 degrees or less by the 16th day of treatment. Treatment was continued for a total of 36 days; the temperature remaining normal after the 30th day of treatment. Recovery was complete.

No improvement was noted over a 7 week period prior to the use of penicillin, but definite improvement followed soon after initiation of this therapy. This serious postoperative complication was cured by penicillin therapy.

INFECTED OPERATIVE WOUNDS

Seven patients whose wounds became acutely infected following surgery were treated with penicillin. Five of these were infected wounds before operation and these infections were increased by surgery. Two were clean cases which were infected at operation. Cultures of the drainage from the wounds usually grew several organisms, the most constant being *Staphylococcus aureus*. Parenteral therapy was administered as previously described. When possible local application of penicillin (250 units per cubic centimeter) was made by injection through catheters or by packing the wounds with penicillin saturated gauze.

Six of these wounds responded remarkably to treatment. One wound although infected with penicillin sensitive organisms was unaffected. In this case the local edema, drainage and healing were not favorably affected by large dosage—20,000 units every 3 hours. In addition this patient was the only one in this series that manifested sensitivity to penicillin. Forty-eight hours after discontinuance of treatment he developed widespread severe urticaria lasting for weeks.

SUMMARY

Fifty patients with infected surgical conditions of abdomen were treated with penicillin as a prophylactic or therapeutic measure.

It is suggested that penicillin sensitive organisms so often cultured from these wounds are an important factor in the infections.

Twelve cases of patients seriously ill with peritonitis, all of whom recovered, are presented. Further use of this drug as an adjunct in the treatment of this disease is urged. Local administration into the peritoneal cavity apparently has a favorable effect.

Based upon the results in 25 cases, further trial of penicillin as a preoperative and postoperative measure in the treatment of infected abdominal surgical conditions is suggested.

We agree with the suggestion of Fauley and associates that the early administration of penicillin should prove invaluable in the prophylaxis and treatment of wounds of the abdomen. It is stressed that patients should be treated early before wide spread dissemination and localization of infection have occurred.

CONCLUSIONS

Staphylococci, most strains of which are sensitive to penicillin, are a factor in the course of many cases of peritonitis and in postoperative abdominal wound infections.

Penicillin is the drug of choice for controlling that part of any infection which is due to staphylococci.

The apparent effectiveness of penicillin in certain cases of peritonitis is sufficient to warrant further investigation.

Infected abdominal wounds in many instances can be operated upon earlier and more safely if penicillin is administered as a preoperative measure. It is our opinion that the disability caused by a long continued infection can here as well as elsewhere be reduced by the judicious use of penicillin.

These observations made at McCloskey General Hospital, Temple, Texas.

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WAR SURGERY OF THE ABDOMEN

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THE risk from wound of the abdomen in World War II is undoubtedly less than in previous wars but that it is yet considerable can be attested to by all who have had experience with them. In an effort to determine the importance of some of the factors influencing the outcome in patients with abdominal injuries a review of our experience in an evacuation hospital during the first year of the Italian campaign is presented. During this period we have been located relatively far forward almost always within 5 to 5 miles of the front and for approximately one half of that time were one of the most forward hospitals. For the other half of the period other hospitals have been in front of us and have usually received the more seriously injured patients.

Our treatment of abdominal injuries has been definitive in character and in most instances complete. Since it is necessary for an evacuation hospital to be ready to receive a rather sudden and relatively large influx of patients we have evacuated patients to general hospitals for secondary operative procedures such as closure of colostomies and the care of infected wounds. Those patients making most satisfactory recovery have likewise been evacuated to the rear for their continued convalescence. We have been able to hold all our patients until they could be safely transported and most of them were well on their way to complete recovery. A postoperative time interval of 7 to 10 days has usually proved sufficient. During occasional periods of great stress evacuation of patients has necessarily been earlier. It is only reasonable to assume that there have been some postoperative incidents and perhaps a few deaths of which we are not cognizant and which can not be included in this report. It is believed however that the mortality figures are practically complete.

We have admitted 411 patients with abdominal injuries of sufficient severity to require laparotomy. Forty three of these patients

were evacuated to us after their operations in more forward hospitals. There were 3 deaths in the postoperative group. Three hundred and fifty-one hit patients were received by us for their initial definitive treatment and form the basis for this study.

PREOPERATIVE CARE

Abdominal injuries are commonly associated with a marked degree of shock and it is imperative to improve the patient's general condition before operative procedures are undertaken. The treatment consists of restoration of the circulating blood volume by the use of blood plasma and whole blood. We have a definite preference for whole blood. The amount given is determined by the patient's response. A systolic blood pressure stabilized above 100 millimeters of mercury is highly desirable. Not uncommonly three or four thousand cubic centimeters of plasma and blood are required in the more seriously injured. These infusions are best given relatively rapidly and two veins are occasionally chosen to expedite their flow. A few hours time may be used to advantage in obtaining the maximum improvement provided the possibility of continued hemorrhage and the hazard of delay in closing intestinal perforations are kept in mind and judiciously considered. For the entire series an average of 5 hours elapsed between the time of admission and operation. Much of that delay was due to the not uncommon backlog of a large number of casualties. Rarely was it necessary to elect a period of longer than 3 hours for preoperative treatment.

Concomitant with the improvement in the patient's general condition a careful appraisal of the abdominal catastrophe is made. Particular attention is paid to the location, character and extent of the wounds. The possibility of missiles entering the abdomen from above below from the sides and back as well as from the front must always be kept in mind. Likewise the possibility of subperitoneal intra

abdominal injuries is indicated by the presence of 9 such cases in this group

When there are penetrating wounds with retained missiles a roentgenographic study is made as soon as the patient's status warrants. The presence and location of the retained missile is of great importance in determining whether or not there has actually been peritoneal penetration and the subsequent planning of the operative procedure

Examination of a urine specimen is important in determining the presence of injuries to the urinary tract. Rectal examination frequently by proctoscope has often revealed a previously undiagnosed lower bowel injury.

Emptying the stomach by inserting a gastric tube preoperatively has greatly facilitated upper abdominal procedures and diminished the likelihood of aspiration of vomitus.

Preparation of the operative field has consisted of shaving and cleansing with soap and water.

TIME LAG

In spite of our relatively close proximity to the front the interval between time of injury and admission, an average of 11 hours has frequently been considerably prolonged which can be largely attributed to the difficulty encountered in moving casualties in mountainous terrain.

The time lag between injury and the institution of surgical care has long been considered a major factor in the mortality rate, and it would seem justly so. That time lag is not the most significant factor, however, is clearly shown in Table I. The extent of the injury and the presence of shock are so much more important factors that the time lag itself is eclipsed. It is our impression that infection, which is so markedly influenced by the time interval, has been greatly diminished as a factor in mortality as a result of chemotherapy. Even in the group of cases with perforation of the gastrointestinal tract in which infection might be expected to be the major factor after a prolonged time interval, no such conclusion can be drawn from our experience.

ANESTHESIA

Ether has been the anesthetic agent of choice. Its administration through an endo-

TABLE I.—INFLUENCE OF TIME INTERVAL BETWEEN INJURY AND OPERATION ON THE MORTALITY IN 37 CASES IN WHICH THE INTERVAL WAS KNOWN

Time —h	All cases			Cases with hollow viscus perforation		
	Cases	Deaths	Survivors	Cases	Deaths	Survivors
Under 1 h						
1-2 h	8					
2-3 h	86					
3-4 h	5			6	8	
4-5 h	3				3	
5-6 h	8					20
6-7 h	8					
7-8 h	8	3	37		3	75
8-9 h	7			5		
Total		6				9

tracheal tube is preferred. The tube affords better control of the respiratory exchange and depth of anesthesia. Operative procedures, particularly in the upper abdomen, are greatly facilitated. It affords the opportunity for turning of the patient for the care of back and extremity wounds with less difficulty than when other methods are employed. The likelihood of aspiration of foreign material is reduced to a minimum and the ease with which secretions are aspirated from the tracheobronchial tree are most important considerations in the prevention of postoperative pulmonary complications. No untoward effects have been observed from its use.

Spinal anesthesia has been used infrequently because of present or impending shock and the frequency of operative procedures which required a longer period of time than the anesthesia would last. Pentothal does not afford sufficient relaxation of the abdominal musculature for its more general use.

MISSILE PRODUCING WOUND

The type of wound and the kind of missile producing it have little or no influence on the mortality as is shown by the following figures. Of a total of 338 cases there were 349 with penetrating or perforating wounds and 9 subparietal wounds. Of the 349 penetrating or perforating wounds there were 233 from shell

TABLE II—RELATIVE MORTALITY RATES IN CASES OF SINGLE VISCERAL INJURY AS COMPARED TO THOSE CASES OF MULTIPLE VISCERAL INJURY

Viscus	Only viscus injured			With associated injury to other viscera			Total		
	Cases	Deaths	Mortality	Cases	Deaths	Mortality	Cases	Deaths	Mortality
Stomach				20					
Duodenum								1	20
Small intestine	5	6		44	5				1
Colon				5			8		
Rectum					5	1			
Liver								5	
Gall bladder						5			
Pancreas									
Lung						60			
Kidneys									
Bladder									

fragment with 49 deaths or a 1 per cent mortality 76 from bullets with 16 deaths or a 20 per cent mortality 14 from mine fragments with 3 deaths or a 21 per cent mortality 2 from bomb fragments with no deaths 3 from stab wounds with no deaths and in 18 cases the instrument of injury was not stated. In these 18 cases there were 2 deaths an 11 per cent mortality. Of the 9 subperitoneal wounds there were 2 deaths or a mortality of 2 per cent. In all there were 72 deaths or a mortality of 20 per cent.

INCISION

The location of the wound and location of the missile as determined by roentgenogram were the chief factors in determining the type of incision to be used. Contrary to a rather common belief that missiles may wander about with most unpredictable consequence it has been our experience that they traverse the abdomen in a straight course and usually the resulting injury may be suspected with a high degree of accuracy. On that assumption the incision is chosen which will afford the best exposure and thereby facilitate the operation.

EXTENT OF VISCERAL INJURY

As shown in Table II the mortality is directly proportional to the extent of visceral injury. In 161 cases with a single visceral

injury there were 20 deaths a mortality rate of 11 per cent. In 103 cases with two or more viscera injured there were 4 deaths a mortality of 40 per cent. Such a contrast in mortality is shown for each viscus and is particularly apparent for the upper abdominal viscera. It is believed that the great frequency of multiple visceral injuries in upper abdominal wounds largely accounts for their relative increased risk. In speaking of the mortality from specific visceral injuries it is important to indicate which cases are included. Thus from our experience with 3 patients with wounds of the colon there were 2 deaths a mortality rate of 6 per cent. However in 51 patients with associated injury to other viscera there were 2 deaths a mortality rate of 4 per cent.

WOUNDS OF THE STOMACH

There were one or more perforations of the stomach in 20 cases an incidence of 8 per cent of 56 cases with visceral injuries. In only one case was the stomach the only viscus injured. In 6 cases the spleen was the only additional viscus injured. In 4 cases the spleen and other viscera were involved. The remaining 10 cases are those with associated wounds of the liver, gall bladder, pancreas, small intestine and kidneys in various combinations.

The stomach was approached through a left thoracoabdominal incision in 9 cases and a right

had thoracoabdominal wounds and through an abdominal incision in 13 patients 4 of whom had thoracoabdominal wounds. Simple closure of the perforations was effected by suturing with catgut and occasionally reinforcing with interrupted silk. There was no instance of overlooked perforations or postoperative complications from leakage or bleeding.

There were 10 deaths in this group all of whom had associated injuries to other viscera. In 7 of this group the spleen was injured. All died relatively early following injury and in none was infection a significant factor.

WOUNDS OF THE DUODENUM

There were 10 cases with perforation of the duodenum an incidence of 4 per cent. All but one of these had associated injuries to other viscera.

Closure of the perforations was accomplished by suturing with catgut and reinforcing with silk or cotton. Extensive mobilization of the duodenum was necessary for the exposure and accurate inversion closure of the retroperitoneal perforations. In 2 cases in which this was not done postoperative fistulas developed which were largely responsible for the deaths. A fistula developed and proved fatal in a third patient whose precarious condition did not permit adequate care for and the closure of a perforation.

There were 7 deaths all of which had associated injuries to other viscera. Except for the 3 in which fistulas developed the duodenal injuries *per se* did not seem to warrant the usual hopeless prognosis given them.

WOUNDS OF THE SMALL INTESTINE

There were perforations of the small intestine in 93 cases an incidence of 3 per cent. In 44 of these cases there were associated injuries to other viscera. The number of perforations varied from 1 to 30—with an average of 3.7 per case. The ileum was injured in 46 cases the jejunum in 43 cases and both in 6 cases.

Simple closure of the perforations with catgut was the usual method of treatment. When it was thought that simple closure of multiple perforation in a relatively short segment of the bowel would result in a mechanical obstruction

or prove too time consuming, the involved segment was resected and an end-to-end anastomosis was done. Resection was done in 7 cases. In 3 of these cases 2 segments were resected and 2 anastomoses were done and in one 3 resections and anastomoses. There were no serious postoperative complications (fistulas, leakage or obstruction) from these procedures during the period of our observation. From the viewpoint of mortality our experience, although too limited to be conclusive, fails to show the increased risk of resection and anastomosis over simple closure as we have employed them and in spite of the usual greater degree of injury at least to the small intestine in the group having resections.

In 1 case with only the small bowel involved there were 6 deaths. In 44 cases with associated injuries to other viscera there were 18 deaths. The mortality from ileal wounds, 13 deaths in 46 cases, was somewhat greater than that from jejunal ones (10 deaths in 43 cases) but that fact was of doubtful significance on detailed case study.

WOUNDS OF THE COLON

The colon was involved in 83 cases an incidence of 28 per cent. In 51 cases there were associated injuries to the other viscera. In 5 cases two segments of the colon were injured.

The procedures employed in the colon cases were more varied than were those for the small intestine. Because of the relative immobility of the colon, closure of large perforations and resection with primary anastomosis as are used for small bowel injuries are more difficult and time consuming and consequently more hazardous. Too the colon may be exteriorized with less distressing and disturbing consequences to the patient than can the small intestine. The contention of those who hold that all wounds of the colon should be exteriorized because of its poor healing tendency and the greater than apparent tissue damage from heel fragments is not supported by our experience. Primary suture of perforations in 5 cases was done without difficulty arising from lack of their remaining closed. The inconvenience of a colostomy, the saving in nursing care, the avoidance of prolonged hospitalization and the avoidance of

in their major operation with a great likelihood of colonic fistula in primary closure are obvious advantages. Equally obvious is the advantage of quickly exteriorizing a badly damaged segment of colon particularly if its blood supply is questionable. The procedure used should be determined chiefly by the extent of the injury.

There were 4 deaths in this group of 6 cases with exceptions all deaths were in patients having associated injuries to other viscera (31 cases).

WOUNDS OF THE RECTUM

The rectum was injured in 6 cases an incidence of 1 per cent. In 2 cases it was the only viscus injured in the remaining 4 cases there were associated injuries to other viscera—the bladder in 3 cases the sigmoid in 1 case and the small intestine in 8 cases. In 7 cases the rectum was perforated above the peritoneal reflection.

Sigmoid colostomy and free drainage of the presacral region with excision of the crecix and closure of the perforation when possible were done in all patients with perforations below the peritoneal reflection with a single exception. This patient had a large acral wound which it was believed would afford adequate drainage. Although he had fractures of both legs and his general condition was never satisfactory at autopsy it was thought that the inadequately drained presacral infection was the chief factor in his death. In the 7 cases with perforations above the peritoneal reflection the perforations were closed and a proximal sigmoid colostomy was done. Three of these patients either had or were suspected as having an additional perforation lower down in the rectum and had presacral drainage from below. In performing the colostomy it is essential to construct a pure and transect the bowel in order completely to divert the fecal stream. Postoperative cleansing of the distal segment of feces by means of daily irrigation diminishes the likelihood of pararectal infection and also facilitates healing of the rectal wound.

All deaths in this group with two exceptions occurred in those patients with associated visceral injuries.

WOUND OF THE LIVER

The liver was injured in 10 cases an incidence of 4 per cent of all cases having visceral injuries. In 8 cases it was the only viscus injured and in the remaining 2 cases there were associated visceral injuries. The extent of the injury varied from a slight penetration with little hemorrhage to extensive lacerations with massive hemorrhage. In 4 additional cases in which small (1 than 6 cm in diameter) recent anastomotic study revealed mild apparently retained in the liver and in which there was no clinical evidence of other visceral injury exploration was not done. The 4 patients recovered uneventfully. In carefully selected cases such conservatism seems justified.

Wound of the liver were drained routinely with a pack of dry gauze in a Lentz or a recte drain which was brought out through a stab wound usually placed in the flank. The drain was left in place for 7 or 8 days then gradually removed. In only 3 or 4 cases was there significant biliary drainage following removal of the drain. Abscesses deeply imbedded in the liver were not disturbed. Fragments of liver were removed. Suturing of laceration was not attempted.

In the 18 cases with only the liver injured there were 4 deaths whereas in the 3 cases with associated visceral injuries there were 14 deaths. Liver wound like that of other single visceral injuries have a surprisingly favorable prognosis.

WOUND OF THE GALL BLADDER

The gall bladder was injured in 4 cases an incidence of 1 per cent of those having visceral injuries. In an additional case it was torn loose from its hepatic bed but the viscus as otherwise intact and required no particular treatment other than suturing back in place. There were associated injuries to the abdominal viscera in all cases. In fact the gall bladder injury was considered rather incidental and presented no great problem. Neither did it appear to be a significant factor in the deaths that occurred in this group. In 3 cases with perforation of the gall bladder a catheter cholecystostomy was done. In the fourth case the viscus was so extensively lacerated

erated that cholecystectomy was the procedure of choice.

WOUNDS OF THE PANCREAS

The pancreas was injured in 13 cases an incidence of 3 per cent of all cases with visceral injuries. In only 2 cases was it the only viscus injured, 11 having associated injuries to other viscera. In an additional case there was a rupture of a pancreatic cyst from a subperitoneal injury.

Wounds of the pancreas were routinely packed and drained by use of a wick through a Penrose drain brought out through a stab wound. In no case was there drainage of sufficient pancreatic secretion to irritate the skin.

Although too few cases to be conclusive, injuries to the pancreas do not appear to warrant the grave prognosis usually given them.

WOUNDS OF THE SPLEEN

The spleen was injured in 36 cases, an incidence of 13 per cent of all cases having visceral injuries. The severity of the injury varied from slight lacerations or penetrations to extensive lacerations. In like manner the hemorrhage from the splenic injury varied from slight to massive. In 16 cases the spleen was the only viscus injured. In 20 cases there were associated visceral injuries.

Severe injuries to the spleen with active hemorrhage demand more urgent operative intervention than do wounds to other viscera, and when the abdomen is opened, care of the bleeding spleen should receive priority over that for other visceral wounds. The surgical approach may be either through the chest and diaphragm or from below, preferably through a subcostal incision. In 19 cases, all of which had thoracoabdominal wounds, the approach was through the chest. In 17 cases, 10 of which had thoracoabdominal wounds, the approach was through the abdomen. A subcostal incision was used in 11 cases, a rectus incision in 6 cases. In 21 cases splenectomy was done. In 15 cases, in which wounds were relatively light and there was no active bleeding at the time of operation, the spleen was not removed. Necrosis in this latter group seems justified, although there were 7 deaths all were

attributed to a localized injury of other viscera, and at autopsy in no case was there found evidence of further hemorrhage from the spleen. The possibility of secondary hemorrhage in those patients recovering later than our period of observation has been recognized, however, no instance of such is known to have occurred.

The seriousness of splenic injuries particularly when associated with injuries to other viscera is shown in the fact that in 20 such cases 12 died. The mortality for the entire group was 44 per cent, or 16 of a total of 36 cases.

WOUNDS OF THE KIDNEYS

The kidneys were injured in 41 cases, an incidence of 14 per cent of the group having visceral injuries. The right kidney was involved in 3 cases, the left in 17 cases, and in 1 case both were injured. The presence of renal injury was almost always suspected from the location of the wound of entry and the location of the missile by roentgenogram. The presence of gross hematuria was a frequent finding in this group. The wounds varied from slight contusions, ruptures and penetrations to extensive lacerations. There were associated injuries to other abdominal viscera in 29 cases, only 12 patients having injury to the kidneys alone.

The traumatized kidney in our experience is best exposed through a subcostal incision. This incision was used in 16 cases, a rectus incision in 16 cases, a flank incision in 6 cases, and a transthoracic approach in 3 cases.

In 16 cases the injury was sufficiently extensive in the opinion of the surgeon to warrant nephrectomy. In the remaining 25 cases more conservative procedures, such as a gauze pack or drain in 16 cases, renal suture in 4 cases, and nephrostomy in 1 case, were used. In 4 cases the injury was found to be of such slight degree as to require no particular treatment. In no patient having these conservative procedures was there significant postoperative renal hemorrhage or infection while under our observation.

There were 17 deaths in this group of 41 cases, a mortality rate of 41 per cent. In the 12 cases with only renal trauma there were 4 deaths, neither of which was attributed to the

renal injury *per se*. There were 5 deaths in the patients not subjected to perinectomy. This is of doubtful significance however since they had extensive associated visceral injuries. The fact that a less severely injured kidney can be saved without undue risk of subsequent morbidity is sufficient justification for conservatism whenever possible.

WOUNDS OF THE BLADDER

The bladder was injured in 13 cases, an incidence of 5 per cent of the group having visceral injuries. In 1 case the bladder only was involved, in 4 cases the rectum was injured, in 4 cases the small intestine was injured, and in 2 cases the small intestine and rectum were the sites of associated injury.

Suture of the bladder perforation with a suprapubic cystostomy and a drain to the place of Retzius was the routine employed.

There were 2 deaths in this group. One death was a result of shock following a large shell fragment wound through the sacrum, rectum and bladder and in spite of massive infusions of whole blood and plasma. The other death was the result of an associated perforation in the small intestine which was not discovered at operation.

WOUND OF THE URETERS

Of the 86 cases with visceral injuries only in one was there a severed ureter. This patient had a gunshot wound perforating his left thigh, pelvis and right buttock. There were compound comminuted fractures of the left femur and multiple fractures of the pelvis. At operation he was found to have a perforation of the distal ileum, the base of the bladder was extensively lacerated and the right ureter was severed about 4 centimeters above the ureterovesical junction. The ureter was reimplanted into the bladder. Closure of the lacerated bladder was incomplete and a drain was inserted down to it. A suprapubic cystostomy was done. Except for some urinary drainage from the bladder wound his postoperative course was uneventful.

THORACIC ABDOMINAL WOUNDS

There were six patients with wounds of the thorax and abdomen in 103 cases. These wounds

were caused by a single missile with penetration of the diaphragm in 35 cases. In the other cases the thoracic and abdominal wounds were caused by separate missiles.

In the treatment of these cases the indication of the chest wound has received priority particularly if there was respiratory difficulty. Once that difficulty was relieved and the general status of the patient permitted the abdominal injury was cared for.

The choice of operative approach to the abdominal injury is a point about which there is much controversy, but in our experience of doubtful importance.

There were 31 deaths in this group of 103 cases, of the deaths occurring in patients who failed to survive long enough for their surgery to be undertaken. Although the mortality rate for cases with thoracoabdominal wound is slightly greater than that for the entire series it is not remarkably different from wound involving the upper abdominal viscera with which the comparison should be made.

Thus it may be concluded from our experience that the thoracoabdominal wound carries about the same prognosis as those involving the upper abdomen alone once the respiratory disturbance if present is relieved. The choice of operative approach has no apparent significant relationship to the mortality.

NO VISCERAL INJURIES

The abdomen was explored with a finding of significant injury to a visceral organ in 64 cases. This group undoubtedly would have fared better with an exploratory laparotomy and in our desire not to err on the other side which did not occur perhaps a few were subjected to operation without sufficient justification. In 20 cases a retroperitoneal hematoma was found at operation which gave rise to abdominal tenderness and some degree of muscular spasm in addition to a penetrating wound usually of the back, making laparotomy seem advisable. In 1 case exploration of the abdomen was done because of present graphic evidence of a foreign body situated at a site which could not be certain whether or not it had penetrated the peritoneum. This number would be considerably larger were it not for our policy of

TABLE III.—APPETENCE WITH CHEMOTHERAPY IN 43 CASES WITH PERITONEAL
 IMITATION OF WHICH 157 CASES HAD HOLLOW VISCERAL PERFORATION

D	P Am	f	All case	De h	Case with h flow in cetera per	D h	De h f m n	De h f m p e tons
Su ionamid	Loc 11	nous d ral	69		5			
Nonamides	In venou	d or l			6			
S i an lam d and pe	Loc 11	muscul	60		5	9	3	
P i II	Loc 2	d i m scul		5		5		
P i II	I m e l		5			8		
	T i				5			7
	p							

debriding and exploring such questionable wounds primarily. In many instances the missile has been found extraperitoneally obviating the necessity for laparotomy. In 14 cases with penetrating wounds of the anterior abdominal wall and muscular rigidity the peritoneum had not been penetrated. In 6 cases with penetrating chest wound and marked rigidity of the abdomen in which the missile was found on roentgenogram to be situated questionably just above or below the diaphragm and in perforating chest wound in which the missile may have also perforated the diaphragm the abdomen was explored and found negative. The frequency of finding abdominal rigidity associated with purely chest wounds was considerable and the 6 mistakes were made in spite of our cognizance of the fact. In 3 cases there was massive destruction of the abdominal wall from large shell fragment but the peritoneum at laparotomy was found intact. One of the 3 cases developed a fulminating clostridial infection in a large flank wound which proved fatal. The only other fatality was the result of a physical trauma complicated by vomiting before recovery from the shock.

CHEMOTRIFERAPY

There can be little doubt that clomethal has played a significant rôle in the low incidence of peritoneal infection following abdominal injuries. Table III shows our experience with clomethal in 4 cases with proved peritoneal penetration or with perforation of the intestine from subparietal injury.

In 11 patients receiving sulfonamides there were 3 deaths attributed to preventable per

TABLE IV — ANALYSIS OF DEATHS

C v f d e a h	Case	R m h
hook	36	8 de h occu red h p occu ra ve f moa f f h f j h l r s f l w n g p A m l f h p o j A dm sa y bou lm on to son, g h
l		3 pa had d ff se i r a i pe on m son An look d pe f se led pe Sev rock ve in ad l on mod ra pe n i f t sup Average um lag t b gr im jury to lm on h bou im on pera h
Full ompl		for l bro h p eumo l m s abl bas t j ase
beta		A ph f om a p f m l ase A ph f m l og case Convuls t ! be know les in sea d veloped f las f low pr sa of duodenal pe ma pa in devolved fus ! f m ove looked d adenal jo
Ass in ed acrasia		Cerri lf ry ppe red le m lo fact
A		A tra foll ng mas ve ra dlor both ase
f ex so ne j use no crin ne j		Inasfer ex so in pa f la k w from ove lookd for m f bel ho pa se t m na ng low dial f h ex in pa hav pe or as 1771 ases had h opera ed be an l nal syndrome we h ase ered spinal cord h no h ng be found to ar for dea
Tot l		

foration and one never recovered from profound shock. It was felt that these 5 cases could not reasonably be charged against the efficacy of chemotherapy. The dosages of the drugs used were sulfanilamide powder 5 to 10 grams locally, sodium sulfadiazine 5 grams each day intravenously, sulfadiazine 5 to 10 grams orally, penicillin units 50,000 locally and penicillin units 25,000 every 3 hours intramuscularly. They were given for a period of a week or 10 days or until the danger from peritoneal infection as determined from clinical progress had passed.

POSTOPERATIVE CARE

Careful attention to the details of postoperative care is of the utmost importance to the severely wounded patient. Since most of these patients have been in some degree of shock preoperatively and replenishment of the circulating blood volume has been started on admission to the shock ward, it has been our practice to continue the infusions during the operation and postoperatively until the hematocrit and hemoglobin determinations approach normal. The gastric tube inserted preoperatively is connected to a Watanabe apparatus and suction is maintained until effective peristalsis is established. Parenteral fluids, plasma and vitamins are given until liquids are tolerated by mouth. Chemotherapy has been used as described. Particular alertness to the development of pulmonary complications is necessary. Encouraging coughing, turning of the patient frequently and occasional tracheal aspiration as well as bronchoscopic aspiration undoubtedly have prevented many serious complications. In spite of chemotherapy, infection of the operative and missile wounds has been a common occurrence and an occasional intra-abdominal abscess has developed. Early detection and the prompt institution of drainage of these infections are most important. Drains and sutures are usually removed prior to evacuation of the patient. Whenever retention su-

tures are used, however, they are frequently left in place until the patient arrives at the base. There have been three wound disruptions in this group while under our observation which required secondary closure.

ANALYSIS OF DEATHS

As shown in Table IV, exactly one-half of the deaths were attributed to shock. Many of those attributed to other causes had a high degree of shock and their resistance was diminished as to preclude their recovery from relatively minor disturbances. It is our impression that the term shock inadequately expresses the true condition because the status of the circulation as determined from the blood pressure and pulse rate may seem adequate but the diminished vitality from extensive wound with some relatively minor complication will result in a fatality. The final diagnosis, died of wound, is probably as accurate as any in the present state of our knowledge.

SUMMARY

1. A review of 358 patients with abdominal injury admitted to an evacuation hospital during the first year of the Italian campaign has been presented.

The extent of the intra-abdominal injury is the most important factor relative to the mortality. Time lag before operation, type of missile and principal viscera involved except for pleural injuries are overshadowed by it and appear relatively insignificant.

Shock was directly responsible for half of the deaths and was at least a secondary factor in many of the others. This in spite of giving large amounts of blood and plasma over an average preoperative period of 4 hours.

2. Infection, peritoneal retroperitoneal and pulmonary, was responsible for about one-fourth of the deaths. It is believed that chemotherapy has favorably influenced this factor.

The sulfonamides and penicillin appear about equally effective in the prevention and treatment of peritonitis.

GUNSHOT WOUNDS OF THE SPINE

Observations from an Evacuation Hospital

JAMES L. LOOL, M.D. Major, MC AUS New York New York

DURING the years 1943-1944 157 patients with gunshot wounds of the spine were admitted to an evacuation hospital while on active service in North Africa, Italy, and southern France. The following report deals primarily with the surgical management in the 35 cases (61.4 per cent) in which laminectomy was done.

Of the 35 laminectomies 3 were cervical, 16 thoracic, 14 lumbar, and 2 sacral. The neurological status showed appreciable postoperative improvement in 30 cases (57 per cent). Of these 30, 1 were lumbar wound, 5 thoracic, 14 lumbar, and 1 cervical. Eleven patients (31.4 per cent) showed no postoperative improvement. There were 4 postoperative deaths in hospital, giving an operative mortality rate of 11.4 per cent. The highest mortality occurred in the combined chest-pine wounds (2 fatalities of 6 such cases). The highest incidence of neurological improvement was noted in the lumbar cauda equina group (11 of 14 cases). The dura mater was intact in 4 cases and lacerated in 11. One spinal cord abscess was encountered, and of 2 cases in which a sizable shell fragment was removed from the substance of the spinal cord, one showed no postoperative progress while the other showed dramatic neurological improvement. Ten patients were considered to be suffering from irreparable spinal cord contusion. The spinal cord lesions due to accidental rather than gunshot wounds are not included in this series.

History. Experience with spinal injuries due to gunshot wounds has demonstrated the fact that the clinical findings, lumbar puncture, and x-ray studies (even though there is still) do not always give a true estimate of the intraspinal path of the bullet nor of the prognostic possibilities. For these reasons each patient should be given the benefit of a laminectomy. Dramatic results having been obtained, it is still hope for such patients is entertained. One paraplegic soldier for example was re-

rated upon 4 weeks after being wounded at which time a thick epidural cuff of fibrous tissue with incorporated bone chips was removed from the level of the 9th thoracic vertebra. Neurological improvement began the first day after operation and continued until the patient began to walk 3 weeks later.

On the principle, therefore, that there is everything to gain and little to lose in this class of war wounds laminectomy is encouraged.

INDICATIONS FOR LAMINECTOMY

The three cardinal indications for laminectomy in compound fractures of the spine are for (1) relief of root pain, (2) closure of lacerated dura (potential avenue for intrathecal infection), (3) decompression of the cord or cauda equina (probably the least urgent of the three).

1. *Relief of root pain* is important on two counts. In the thoracic level it may seriously retard respiratory excursions of the chest wall and discourage coughing—which is essential for adequate expulsion of intratracheal mucus. In the lumbar level intense prolonged root pain may through reflex cardiorespiratory arrest or shock cause death.

In support of the first statement a case may be cited (unfortunately not seen by a neurosurgeon) in which autopsy revealed a large cluster of ragged bone chips entangled among the roots of the cauda equina following gunshot wound at the 12th lumbar vertebra. Despite heavy sedation and morphine this patient suffered almost unremitting agonizing pain in both legs, causing him to scream aloud. Death occurred within 4 hours of the injury and was believed to be the result of reflex shock occasioned by the acute pain and traumatic stimulation of the affected nerve roots.

Four of 5 patients having similar severe root pain were operated upon with immediate postoperative relief. The condition of the 5th

foration and or never recovered from profound shock. It was felt that these cases could not reasonably be charged against the efficacy of chemotherapy. The dosages of the drugs used were sulfanilamide powder 5 to 10 grams locally, sodium sulfadiazine gram each day intravenously, sulfadiazine grams 1 four times daily orally, penicillin units 50,000 locally and penicillin units 5,000 every 3 hours intramuscularly. They were given for a period of a week or 10 days or until the danger from peritoneal infection as determined from clinical progress had passed.

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Careful attention to the details of postoperative care is of the utmost importance to the severely wounded patient. Since most of these patients have been in some degree of shock preoperatively and replenishment of the circulating blood volume has been started on admission to the shock ward, it has been our practice to continue the infusions during the operation and postoperatively until the hematocrit and hemoglobin determinations approach normal. The gastric tube inserted preoperatively is connected to a Wangensteen apparatus and suction is maintained until effective peristalsis is established. Parenteral fluids, plasma and vitamins are given until liquids are tolerated by mouth. Chemotherapy has been used as described. Particular alertness to the development of pulmonary complications is necessary. Encouraging coughing, turning of the patient frequently and occasional tracheal aspiration as well as bronchoscopic aspiration undoubtedly have prevented many serious complications. In spite of chemotherapy, infection of the operative and missile wounds has been a common occurrence and an occasional intra-abdominal abscess has developed. Early detection and the prompt institution of drainage of these infections are most important. Drains and sutures are usually removed prior to evacuation of the patient. Wherever retention u-

tures are used, however, they are safely left in place until the patient arrives at the base. There have been three wound disruptions in this group while under observation which required secondary closure.

ANALYSIS OF DEATH

As shown in Table IV, exactly one-half of the deaths were attributed to shock. Many of those attributed to other causes had such a degree of shock and their resistance was so diminished as to preclude their recovery from relatively minor disturbances. It is our impression that the term "shock" inadequately expresses the true condition because the status of the circulation as determined from the blood pressure and pulse rate may seem adequate but the diminished vitality from extensive wounds with some relatively minor complication will result in a fatality. The final diagnosis died of wound is probably as accurate as any in the present state of our knowledge.

SUMMARY

1. A review of 338 patients with abdominal injury admitted to an evacuation hospital during the first year of the Italian campaign has been presented.

The extent of the intra-abdominal injury is the most important factor relative to the mortality. Time lag before operation, type of missile and principal vessels involved except for splenic injuries are overshadowed by it and appear relatively insignificant.

3. Shock was directly responsible for half of the deaths and was at least a secondary factor in many of the others. This in spite of giving large amounts of blood and plasma over an average preoperative period of 5 hours.

4. Infection, peritoneal, retroperitoneal and pulmonary was responsible for about one-fourth of the deaths. It is believed that chemotherapy has favorably influenced this factor.

The sulfonamides and penicillin appear about equally effective in the prevention and treatment of peritonitis.

along the course of each metatarsal usually resulted in low vermicular response of that toe more widespread sweeping plantar stimulation would evoke a similar response in several or all the toes of that foot. An appreciable delay was noted between the time of plantar stimulation and the evoked toe response which seemed definitely reflex rather than mechanical in character. Abdominal reflexes were not obtained in these patients. The levels of unequivocal cord transection in these cases were at the 2d cervical 2d 4th 6th and 7th thoracic vertebrae.

The delayed vermicular plantar toe reflex demonstrable in patients having a complete cord lesion would seem to be at variance with the commonly accepted views on cord physiology which teach that the initial findings are total areflexia below the affected level due to spinal cord shock. Another exception to this rule was the patient having total sensory and motor paralysis below a cord abcess at the 7th thoracic vertebra who was subject to frequent spontaneous painful contractions of thighs and legs not unlike the mass withdrawal reflex seen in long standing cases of cord transection. Yet in this instance these contractions were apparent during the first 20 days after injury. It is hoped that other observers will seek for similar signs in similar cases so that a proper explanation and evaluation may be arrived at. Another neurosurgeon has already mentioned (personal communication) seeing these motor responses in some of his early cord cases.

COMPLICATIONS ASSOCIATED WITH SPINAL INJURIES

Chest complications. Hemopneumothorax and pulmonary contusion have been associated either unilaterally or bilaterally with 6 of the 16 thoracic spinal wound subjects to laminectomy. Four of the 6 patients had a stormy postoperative course even though the x-ray picture was satisfactory. One died during the first 24 hours. The latter evidently injured an additional structure in an already burdened cardiorespiratory system manifested by intermittent hiccups and dyspnea of variable degree regardless of effort to control them with repeated thoracentesis and intrapleural

ral catheters oxygen transfusions nasopharyngeal and intratracheal suction etc. Two of the 6 cases proved fatal.

Some of the presumed alterations in physiology encountered in this type of case include: (1) incomplete expansion of the lungs due to residual hemopneumothorax or pulmonary contusion (2) curtailed oxygenation due to respiratory embarrassment occasioned by paralysis of the intercostal and abdominal musculature (3) faulty expulsion of mucus because of difficulty in coughing owing primarily to inability to fix the thoracic cage and abdominal muscle as a preliminary to the act of coughing (4) tendency to postoperative pulmonary congestion on these accounts (5) possible reduction of normal systemic blood pressure response similar to that sometimes seen after spinal anesthesia due to the flaccidity of the paralyzed half of the body.

Precautionary preoperative measures might well include the following: (1) Allow ample time for fullest possible stabilization of the cardiorespiratory system before laminectomy. (2) Encourage deep breathing and coughing on regular schedule. (3) Insure adequate blood volume red blood cell count and hemoglobin values. (4) Resort to a scrupulous and if need be heroic use of nasopharyngeal and intratracheal catheter suction or when indicated bronchocopy. All of these latter measures have been used with obvious benefit and success thanks to help from the chest specialist. (5) Epinephrine preoperatively may serve to counteract a tendency to hypotension occasioned by flaccid paralysis.

Abdominal complications. Intra-abdominal hemorrhage perforation of bowel or laceration of kidney are urgent indications for operation that should precede laminectomy.

Of the 14 compound comminuted fractures of the lumbar spine 6 required major surgery other than laminectomy 4 nephrectomies 1 kidney exploration 1 laparotomy. Four of the 6 who improved after laminectomy 1 showed no improvement and 1 required death due to pulmonary embolism.

OPERATIVE TECHNIQUE

Little need be added to the extensive literature on the subject of operative technique

It is suggested however that normal dura be exposed above and below the site of injury so that dissection can be carried thence up to the actual point of trauma with least hazard to cord and nerve roots. It is usually safer to avoid opening the dura in potentially infected wounds unless there is an evident block or underlying hematoma. When the dura is lacerated it should be opened widely so as to ensure removal of all bone and metal fragments, clots or clothing that may be driven into the spinal canal. Nerve roots that are completely torn should be cleanly trimmed and their cut ends secured if necessary with silver clips. This procedure effectively alleviates postoperative root pain. It is probably best to avoid using the electrocautery in close proximity to cord or roots lest its disseminated heat further damage these structures. The dura should always be closed as it is evident that the incidence of meningitis is thereby appreciably cut down. Dural repair may be accomplished by direct suture or by a fascial dural or fibrin film patch. In the closing of a badly contaminated wound it is best to leave the skin untutured and approximate only the deeper muscle layers. When extensive loss of tissue makes muscle closure impossible it seems best to close the skin and to leave a drain in the wound for 4 to 48 hours. Contact of sulfa drugs with the spinal cord had probably best be avoided. Diluted penicillin however has proved harmless and effective when introduced intrathecally and has been frequently used in this manner in this series.

Spinal fusion has been resorted to on only one occasion. In this prisoner of war a machine gun bullet had penetrated the back cutting across part of the cauda equina at the 1st lumbar vertebra then lodging firmly within the body of that vertebra. The wound was grossly clean the destruction of the vertebral body considerable so that it seemed both safe and expedient to pack clean bone chip (from the adjacent spinous process) firmly into the wound flood with penicillin solution and close tightly. The patient made an unusual recovery showing surprisingly prompt and rapid neurological improvement so that it was felt that he would virtually be able to walk and void reasonably well. Roentgen

ograms taken 2 weeks after operation showed no signs of osteomyelitis.

Postoperative care. The usual measure should be taken including frequent turning, the aspiration of mucus as indicated and sulfadiazine or penicillin or both as preventative chemotherapy. The leg should be elevated when the patient is paraplegic (1) to avoid overstretching of muscles (2) to avert undue venous stasis and the risk of consequent thrombophlebitis. Active and passive exercise should be encouraged and an ambulatory patient assigned to this task in busy hospital. Suprapubic cystostomy has proved desirable in all patients having partial or total bladder paralysis. When these patients are transferred to a general hospital tidal drainage can be instituted.

COMMON CORD LESIONS

The common cord lesions seen in this series include the following: spinal cord concussion, contusion, crushing, laceration, hematomyelia and mechanical physiological block. Combinations of some of these conditions have been observed in several cases sometime leading to difficulty in establishing a correct classification.

Concussion. Sign and symptom of partial or complete cord dysfunction at the level of injury which as a rule begin to clear away within a few hours at most following injury and clear completely by the end of 3 to 5 days. This condition is usually the result of an impact directed against a vertebra whence the force is transmitted to the cord. The missile may however pass just the spinal canal without touching a vertebra more often it passes through a part of a vertebra or ricochet off it. Thus there may or may not be an associated fracture. Generally there is no dural penetration though the dura may be struck or grazed by the offending missile or a detached bony chip. The neuroma of the cord probably represents temporary disturbance of neurocytoplasmic flow with all its ramifications of the cytoplasm.

Concussion (1) presents and symptoms if persistent usually indicate more lasting if not permanent cord damage due to direct physical rather than physiological cell trauma.

ma or associated chemical and hemorrhagic changes or both. The injury is essentially the same as that described for concussion but more drastic. A contused cord may be soft, mushy and edematous at the site of injury and may or may not look swollen or hemorrhagic depending on the type and severity of the injury.

Crushing, lacerating or hemorrhagic (hematomyelia) cord lesions may simulate concussion or contusion from the clinical standpoint but can usually be readily recognized on direct inspection at operation or autopsy.

Abscess. Abscess of the midthoracic cord was encountered only once in this series. Laminectomy was done for a total cord lesion at the level of the 7th thoracic vertebra. There was partial spinal fluid block, xanthochromic fluid and 4 plus protein. The patient had been wounded 20 days prior to operation by a bullet that perforated the right pleural cavity before fracturing the 7th thoracic neural arch. There were no clinical or cerebrospinal fluid signs of meningitis. At operation the cord at the level of injury appeared softened, partly cystic and unusually mushy throughout its entire diameter for a longitudinal distance of 1.5 centimeters. Culture grew staphylococcus, numerous micrococci and gamma streptococci. Penicillin was placed in the wound before the dura was completely closed. The patient recovered with no change in neurological status and without meningitis.

MORTALITY

In the 3 operative cases reported there were 4 deaths in fatalities patients had lesions of the thoracic spine and 2 of these had associated chest wounds. The causes of death were:

1 Pulmonary embolus secondary to thrombophlebitis of left femoral vein. Laminectomy was performed for severe compound comminuted fracture of 1st lumbar vertebra with laceration of most of the nerve root at the level probably due to laceration at right lumbar disc. The patient also had partial transient meningitis (culture not reported) which was no longer clinically present at time of death. The cause was then evidently the fracture. Twelve months after operation the patient had

been receiving sulfadiazine by mouth and penicillin (intramuscular and intrathecal administration).

2 Hemopneumothorax, persistent despite indwelling intrapleural catheter and frequent thoracenteses. Laminectomy was done at the 6th thoracic vertebra. Contusion of cord was complete at autopsy. (Dura not opened at operation).

3 Hemothorax, left moderate atelectasis, bilateral hemoperitoneum—1200 cubic centimeters of fresh blood from punctured right diaphragmatic artery during 1st thoracentesis—evidently the precipitating cause of death. Laminectomy was done at the 5th thoracic vertebra. Massive hematomyelia of cord was found at autopsy.

4 Brain abscess, left frontal, secondary to postoperative acute pansinusitis. Death occurred despite decompression of abscess and sinuses. Laminectomy was done at the 1st thoracic vertebra.

It is apropos to mention here that since spinal lesions may make pathology in anesthetic area of the body unusual care must be exercised in searching for such conditions as thrombophlebitis in the legs, intra-abdominal hemorrhage, etc.

For purposes of comparison all patients having gunshot wounds of the spine admitted to this hospital during the years 1941-1944 have been summarized that is the patients who would have had laminectomy had their condition permitted or warranted and the 35 patients just reported who did have laminectomy.

This summary indicates that of the total of 7 patients nearly two thirds could be given the benefit of a laminectomy. 4 patients or 44 per cent had major associated wound, meningitis occurred in 5 patients not operated upon having dural penetration (and of these proved fatal) while only 1 transient case occurred in the group operated upon. Fifty-seven per cent of the patients operated upon showed marked neurological improvement after laminectomy, again 44 per cent postoperative improvement in the series not operated upon.

It is also apparent that the incidence of meningitis is highest in the patients having

lumbar spine wound. Finally, though the operative group is obviously a selected one, the best all around results are apparent in it.

SUMMARY

1. All patients with spinal wounds who were admitted to an active Army Evacuation Hospital during the years 1943-1944 due to gunshot wound (battle casualties) and having evidence of involvement of the spinal cord or root are reported.

2. Of a total of 57 patients, 35 or 61.4 per cent were subjected to laminectomy. As to mortality rate, neurological improvement and low incidence of meningitis, this group

had by far the better record as compared with the group not operated upon.

3. The following concepts are discussed: (a) advisability of laminectomy whenever indicated; (b) indications for laminectomy (for relief of pain, for dural closure, for decompression of cord or cauda); (c) advisability of delaying laminectomy in the presence of an associated chest wound; and of early laminectomy in cauda equina lesions.

4. A plantar vermicular reflex is described that may prove of value in estimating the extent of cord lesion.

5. Spinal cord concussion, contusion and other injuries are discussed.

Factors Contributing to Its Progress

IRFITT M CARLTON Jr MD and W F ADAMS MD FACS Ch c go Ill no s

This study is based on experience with 59 patients observed mainly during the past 5 years and consists of 45 operations on 36 patients for primary bronchiectasis, 9 cases of bronchiectasis secondary to bronchial tumors and tuberculous, 7 cases of infected cystic disease of the lung and 7 cases of chronic non specific pulmonary suppuration.

Patients with chronic infection of the lung should be hospitalized for a minimum of 3 or 4 days for observation and laboratory examinations before operation. Our patients receive the routine laboratory study viz blood urine vital capacity putum culture and examination for acid fast bacilli. If anemia and hypoproteinemia are present they are corrected by transfusions of whole blood. Stereoscopic roentgenograms of the chest are made before and after bronchography. Bronchography is usually by the a. piratory method is carried out under

OPERATION

The patients are placed in the Trendelenburg position of 20 to 30 degrees with the operative site upward. This facilitates drainage by gravity of mucus into the face mask during surgery. When this is accomplished very little difficulty due to respiratory obstruction has been encountered. Blais and Graham (3) have suggested that in bilateral bronchiectasis the patients be placed

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in a semisitting position while the first stage is being performed. The secretions from the lung tissue being removed would then gravitate into the dependent infected lobe of the opposite side instead of into the trachea and thus minimize the danger of suffocation during the operation. We have not found the use of intratracheal anesthesia to be of any real advantage in removing bronchial secretions and thus have avoided the occasional operative and postoperative complications reported with that method.

Operative technique. Adequate exposure is essential and for lower lobectomy is usually obtained by the resection of a long segment of the 7th rib. For pneumonectomy or upper lobectomy, resection of the 5th or 6th rib is preferable. The phrenic nerve is then crushed. This decreases the motion of the diaphragm, facilitates the technical procedures and aids in the rapid obliteration of the remaining space following resection. Whereas in the earlier part of our experience the tourniquet technique and closure of the bronchial stump with mattress sutures was employed during the past years the dissection technique with individual ligation of vessels as worked out and described by Blades and Kent (4) has been the procedure of choice in the majority of cases. This technique is now used even in cases in which the fissure is incomplete or in which marked infiltration about the hilum is present. This has been one of the major factors in the reduction of complications and morbidity of lung resection for suppurative disease. In the dissection technique the vessels are mobilized and doubly ligated with linen. If they are of a large caliber and short the distal ligature is a transection suture. Before division of the bronchus laparotomy pads are placed about this region to minimize contamination. Closure of the bronchial stump formerly was accomplished by two rows of sutures the proximal one being mattress in type. More recently closure has been made with a single row of double No. 00 chromic catgut sutures and far fewer postoperative empyema or bronchial fistulas have resulted. Prior to the placing of suture the bronchial secretion are removed with a dry swab following which the mucosa is de-

stroyed by cauterization with a 1 per cent solution of silver nitrate. Since this technique has been employed no bronchopleural fistulas and only empyemas have occurred in operations including 4 bilobectomy and 1 pneumonectomy. When the dissection technique is used care must be exercised in ligating the artery and closing the bronchus for the blood supply and air passage to the adjacent remaining lung may easily be impaired as pointed out by Blades and Kent (4) and Churchill (5).

After the bronchial stump is closed 10 grams of sulfathiazole is sprinkled about the bronchial stump and pleural cavity. A No. 6 Pezzer catheter is brought out through a stab wound in an intercostal space posteriorly for continuous suction drainage of the pleural cavity. (In pneumonectomy sulfonamides are not used locally and the pleural cavity is not drained.) All areas of atelectasis in the remaining lung tissue are reexpanded by slightly increasing the positive pressure and massaging the lung. The chest wall is then closed with two paricostal sutures of a double strand of chromic catgut. The intercostal structures are approximated with chromic No. 00 catgut. We have not observed persistent severe pain following the use of paricostal sutures as have some authors. The pleural space is aspirated by means of a pneumothorax apparatus until a negative pressure of approximately 5 to 10 centimeters of water is obtained. We feel that the re-expansion of the lung in this fashion is less apt to produce postoperative pneumonia and interstitial emphysema than if inflated by the use of high intratracheal pressure.

Immediately following surgery the patients are bronchoscoped if there is a question of accumulation of secretions in the tracheobronchial tree.

Replacement of the apy. There is no doubt that fluid and blood replacement therapy plays a major role in the lowered morbidity and mortality associated with lung resection. White and Burton (18) have found 1,000 to 2,000 cubic centimeters of blood is lost during a lobectomy and an average 1,000 cubic centimeters during a pneumec-

tomy. Therefore our patients undergoing lobectomy and pneumonectomy received 1000 to 1,500 cubic centimeters of whole blood during surgery. In this way anemia hypoproteinemia and shock are obviated. It is much more desirable to prevent shock than to wait for its occurrence before treatment is instituted. Infections complicating the operation should be less frequent if a normal state of the blood including plasma protein level is maintained. (6) Wound healing is also favored. (17)

POSTOPERATIVE CARE

The four most important factors in the postoperative care are (1) avoidance of anoxia (2) maintenance of a clear bronchial tree (3) early expansion of the remaining lung on the operative side and (4) control of infection.

Anoxia. Oropharyngeal insufflation of oxygen is started immediately after surgery and is continued for at least the first 4 hours. It is known that after pulmonary resection there is often a mild degree of anoxemia that may last for several days even in the absence of serious postoperative complications. Maier and Courmand (13) have shown that there may be a more prolonged and severe degree of anoxia after uncomplicated lobectomy than after pneumonectomy. They explain this by the fact that the remaining lung on the side operated upon aerates poorly immediately following surgery while the circulation is not reduced in proportion. Thus the difference between circulation and aeration accounts for inadequate oxygenation of the blood leaving the remaining lung tissue on the side of operation. Maintenance of a normal status of the blood by replacement of blood loss during surgery is of primary importance in the prevention of anoxia.

Secretions. It is imperative that the tracheobronchial tree be as free as possible of secretion before and following operation. Secretion is an important factor in the state of patients and bronchospasm following surgery will raise any question of increased bronchial secretions. As soon as consciousness is regained the head of the bed is elevated 4 to

75 degrees and the patient is urged to cough and move about in bed in order to clear the air passages. Catheter suction of the nasopharynx and trachea is employed at the slightest indication of secretions in the tracheobronchial tree. This not only removes secretions readily but stimulates a more effective cough for clearing the air passages. If the tracheobronchial secretions are removed thoroughly following surgery the tendency for further secretions to develop is decreased. If cough or catheter suction is insufficient to remove the secretions the patient should be bronchoscoped immediately.

Expansion of the lung. By means of constant pleural suction (1) and maintenance of a clear tracheobronchial tree we strive to overexpand the remaining lung tissue and completely obliterate the pleural space as rapidly as possible. This usually requires 12 to 48 hours. Early overexpansion of the remaining lung and obliteration of the space reduces the incidence of serious pleural infections and postoperative morbidity. If expansion of the remaining lung tissue fails an empyema may be expected. The drainage catheter should be large enough to remove the pleural fluid and air as the remaining lung tissue fills the hemithorax. If loculation of the pleural fluid occurs thoracotomy is immediately performed. A fluoroscopic examination is made within the first 1 to 4 hours to evaluate the status of the chest and is repeated frequently thereafter during the entire period of hospitalization.

Infection. The prevention and control of infection have been major problems. However due to the many advances in improved culture of the bronchus early expansion of the lung maintenance of a clear tracheobronchial tree and the use of chemotherapy (ulframides or penicillin) the incidence of serious infections has been greatly reduced. All patients now receive sulfa drugs or penicillin before and following operation. They have been used in the pleural cavity. It is a little doubtful but that the use of these drugs is of definite value when combined with improved operative procedures.

Due to the lack of an adequate supply of penicillin for civilian usage this agent has

TABLE I—TREATMENT AND RESULTS IN 36 PATIENTS WITH PRIMARY BRONCHIECTASIS IN WHOM 4 OPERATIONS WERE MADE

Operation		Sex		Pth		Comp				Results				Deaths		Remarks
Classification	N	M	F	C	B	A	Am	II	I	Good	Fair	Long	I	II	I	
A. Dissection, echinococci, I. Sulphonamides vs. penicillin																Especially case of ed. year ju. be ore. f. p. m. u. d. l. ned sec.
II. Sulfonamide vs. minimal local																
B. Tourniquet, ech. ul. n. m. u.	5							8		8						Pneumonia f. per. u. mor. T. m. j. S. m. h. s. p. m. ope.
II. Sulfonamide			8					3		6						T. n. s. r. e. l. o. r. e. k. ad. ope. son. t. S. r. s. fol. w. gery.
III. Sulfonamide vs. minimal local																
Total				5				5								
P. re. l. a. s. s. e. d. o. c. r. d. i. n. g. t. h. y. p. e. f. p. e. r. s. o. n. a. n. d. u. s. e. f. h. m. o. t. h. r. a. p. h. t. u. n. i. l. a. r. a. l. b. i. t. e. r. a. l. A. l. l. e. c. t. a. s. i. s. E. m. p. t. y. m. a. s. t. i. s. t. u. l. P. e. u. m. o. n. i. a. E. x. t. r. a. m. u. l. t. i. p. l. e. s. o. f. p. l. a. n. t. a. r. y. o. c. c. i. s.																

been employed in only a few patients. Our experience as well as that of others (14, 19) suggests that penicillin may be of even more value than the sulfonamides in the prevention of complications.

In order for the patient to have the best resistance against infection a good general condition must be maintained. Repeated blood and urine examinations, plasma protein determinations and blood sulfonamide level are made to insure the best possible management.

PRIMARY BRONCHIECTASIS

The treatment of bronchiectasis is remained a difficult problem for the surgeon until the present decade but recent results indicate the marked progress which has been made.

In 1933 Graham (8) reviewed the literature and found that in 48 cases of lobectomy for bronchiectasis there had been an operative mortality of 5 per cent. Because of the hazard of lobectomy he devised an operation which he termed cauterized pneumonectomy and in 1934 reported 20 cases with an operative mortality of 0 per cent. (9). The modern operation of multiple lobectomy was first made by Brunn in 1900 who reported 6 operations with 4 cures and

unimproved and 1 death. Shennstone and Janes of Toronto improved on the method of Brunn by use of the tourniquet. Since 1919 almost incredible results have been obtained. Statistics from leading clinics in the United States and England reveal that the average mortality for lobectomy in bronchiectasis is now only about 5 per cent. (10). As has been pointed out there are a number of factors that have been responsible for the lowered mortality.

Table I shows the treatment and results in 36 patients with primary bronchiectasis in whom 43 operations were made. Of this group 10 had bilateral involvement. The patients ranged in age from 1 to 54 years. The cases have been divided into 2 groups depending on the type of treatment employed viz (A) ductotomy technique and (B) tourniquet technique. Each group has been further subdivided into three parts: (1) patients in whom roentgen makes were used; (2) patients in whom sulfonamides were used systemically; and (3) patients in whom if rarely used both systemically and locally.

In the first series of 10 patients the results of multiple therapy Group I are as follows: 1 female and 1

TABLE II—RESULTS FOLLOWING LOBECTOMY OR INFUNDULECTOMY IN SEVEN PATIENTS WITH CHRONIC NONSPECIFIC PULMONARY SUPURATION

Case	P	Lobes	O ₂		Sulfonamide		Complica				Results	Remarks
			D	Tox	m	Excl	A	Fmp	F	P m		
	A. R.	LL		+	+	—					E	
	F. S.	RL		+	+	—					F	
3	H. I.	LL		+	—	—		+			F	
	F. G.	RL	+		+	+					E	
5	Wm. D.	LL	+		+	+					F	Infected fistula
6	A. C.	RU & M	+		+	P. II					E	Pneumococcal
	G. H.	RL	+		+	+					F	Pleural (M)
In dissection echin Tou m m ech qu A l ectas Lmp m m f tis ul Pnc m eum E ecile												

1 male Bilateral pathology was present in one of the patients. This group received sulfonamides systemically and developed no postoperative complications following surgery. The results in this group of 3 patients were excellent. The second group consisted of 7 patients 4 female and 3 male with bilateral pathology in 2 cases. Of the 7 patients 2 developed an empyema following operation (no fistula) which healed following open drainage. The results were excellent in all 7 patients. In 1 of the bilateral cases only one lobe has been treated surgically. One patient died 1 year after operation of pneumonia just before a contemplated reoperation for bronchiectasis of the opposite lung.

B Tourniquet technique Group I Sixteen operations were performed on 11 females and 5 males the tourniquet technique being used but no sulfonamides. In this group 11 of the 16 patients had bilateral disease. The postoperative complications were more frequent in this group than in any of the other groups. Intraoperative atelectasis occurred in 3 patients an encapsulated empyema developed in 12 5 of whom demonstrated a bronchial fistula and 3 patients had pneumonia. Of the group of 16 patients 8 had excellent result 5 good 1 fair 1 poor and there was 1 death. A patient with bilateral involvement died 3 days following operation of pneumonia (1941). There have been late deaths due to the disease in this group. One

was a patient with bilateral disease who died of pneumonia over 3 months after surgery. The other patient died of acute nephritis and pneumonia over 1 year after surgery.

Group II Fifteen operations were made on 8 female and 7 male patients the tourniquet technique being used with sulfonamides administered systemically. Bilateral bronchiectasis was present in 11 of the 15 patients. Empyema as a complication was present in 10 patients with 8 having an associated bronchial fistula. One patient developed pneumonia. The results were excellent in 6 patients good in 4 and fair in 4. There was 1 early death and 1 late death and more surgery is still contemplated in 3. The early death was in a patient with bilateral involvement who developed an empyema bronchial fistula and progressive infection of the chest wall which eventually led to a transverse myelitis 6 weeks following surgery. The late death was in a patient with bilateral involvement and was due to a complication of the disease namely metastasis to the brain 1½ years after an operation on the more involved side.

Group III The third group consisted of 4 bilateral cases 2 males and 2 females. In these patients the tourniquet technique was used and sulfonamides were given both locally and systemically. There were no postoperative complications and the results were excellent in all 4 patients. These operations were all made within the past 2 years.

TABLE III—RESULTS FOLLOWING LUNG RESECTION IN 7 PATIENTS WITH CYSTIC DISEASE OF THE LUNG (INFECTED)

Case	P	P h Lobe	Operation		Self Therapy		Complications				Result	Remarks
			I	Tou	vs m	Loc l	A l	Em	I	Pneu		
	J C	LL		+	+			+			E	
	L F	LL LL	+		+					+	F	
3	I F	R l	+		+						E	
	P R	R l RL		+	+	+		+	+		F	P l pl al
	P C	R l	+		+						E	
	D O	LL	+		+	+					F	P l l l usc
	L A	RL	+		+	+					E	P n l l l

TABLE IV—RESULTS FOLLOWING LUNG RESECTION IN 6 PATIENTS WITH BRONCHIECTASIS SECONDARY TO PULMONARY TUBERCULOSIS

	E H	R l & RL		+			+	+		U	P r s al	vs lobe
	I S	RL		+	+		+			L	d be lobe	k l l RL lobes
	S B	LL		+	+			+		F		
	A f	LL		+						F		
5	M B	LL		+	+							
	L E	RL	+		+							

TABLE V—RESULTS FOLLOWING LUNG RESECTION FOR BRONCHIECTASIS SECONDARY TO BRONCHIAL TUMOR (3)

	G f	RL	+		+		+		D f	R og l h	an re
	W W	RL		+					E		
	R T	R l & RL	+		+				E		

Dissection followed penicillin treatment. A l l ectasis Em mpy F l l a P ne mo

CHRONIC DIFFUSE PNEUMONITIS

Table II shows the treatment and results obtained in patients with chronic diffuse pulmonary suppuration. In the patients the pathology was located in a lower lobe in 5 instances. In all these patients the pathological picture was that of a diffuse pneumonitis without cavity formation. In 6 of the 7 patients sulfonamids were administered systematically and in 4 of the 7, the operation was performed by the direct incision technique. The patient receiving no chemotherapy developed the only complication in the entire group, it being an empyema (without a bronchial fistula) that healed

readily after pen drainage. In the only pneumonitis in this series penicillin was placed in the pleural cavity. Complete relief of symptoms was obtained in all patients.

INFECTED LUNG CYST

Table III shows the treatment and results obtained in 1 patient with infected cyst of the lung. In this patient the direct incision technique was used and in postoperative complications developed. The results were excellent. In this patient in whom the tourniquet technique was used both patients had postoperative empyema and needed a bronchial fistula. The latter, however,

were satisfactory in both patients. Sulfonamides were administered systemically to all of these individuals. Two also received penicillin systemically and one locally.

BRONCHIECTASIS SECONDARY TO TUBERCULOSIS

Table IV illustrates the treatment and end results in 6 patients with bronchiectasis secondary to pulmonary tuberculosis. The pathological lesion was in the left lower lobe in 3, the right lower lobe in 3 and in 1 of the latter also in the right middle lobe. In 5 of the 6 patients the tourniquet technique was employed and 4 patients received sulfonamides systemically. Patient L. H. had an empyema with fistula following surgery. Her condition was unimproved due to the persistent tuberculosis in the right upper lobe. Patient M. S. developed atelectasis in a tuberculous right upper lobe following surgery. She continued to have tuberculosis of the right middle and right upper lobes but at present her condition is improved. Patient S. B. developed an empyema but the final results were satisfactory. Patient A. M. developed a fistula following surgery which healed several months later. She has been asymptomatic for 3 years. The remaining 2 patients had no complications following surgery and were relieved of their symptoms.

BRONCHIECTASIS SECONDARY TO TUMOR

Table V presents the treatment and end results in 3 patients with bronchiectasis secondary to bronchial tumor. In patient G. M. the right lower lobe was involved. This was removed by the dissection technique and she received sulfonamides systemically. She developed an infarct and an empyema and died 14 days following operation due to retrograde thrombosis and pneumonia. Patient W. W. had the right lower lobe removed by the tourniquet technique. No sulfonamides were given there were no complications and the patient has been completely relieved of symptoms. Patient R. T. had the right middle and right lower lobes removed by the dissection technique. Sulfonamides were given systemically. There were no complications and the final result was excellent.

DISCUSSION

The morbidity and mortality associated with the surgical treatment of bronchiectasis may be influenced by a number of factors (3, 11). In addition to those already discussed the age of the patient, duration, distribution and severity of the disease markedly influence the course and results of surgical treatment. In the series of 36 patients studied (45 operations) 6 had bilateral involvement and as pointed out by Blades and others the surgical risk is considerably greater than when the lesion is limited to one side. There were two operative deaths and both followed the first operation for bilateral involvement. Eight of the 20 bilateral group have had both operations completed the course following the second operation being less difficult than after the first. This is partly due to the marked improvement that usually follows the first operation thus making them better surgical risks and also because little or no diseased lung remains after the second operation.

The total amount of lung tissue that may be safely removed has been investigated by Heuer and Andrus (11) and others as well as by ourselves (12). Dogs have been observed for several years following the reduction of lung function to a single upper lobe (13 per cent) and when at rest appear entirely normal. When placed in a pressure chamber under reduced atmospheric pressure the respiratory reserve compares surprisingly well with that of normal animals.

Clinical experience shows that human beings may also tolerate the removal of a large percentage of the total lung capacity. Crampton (10) in 1940 reported the successful removal of both lower lobes, the right middle lobe and the lingula of the left upper lobe without the production of dyspnea or other physical handicaps. In 2 of our 5 completed bilateral operations the same amount of lung resection was made. Both patients returned to full time work following surgery.

When bilateral operations are contemplated sufficient time following the first operation for complete recovery and obtaining its beneficial effects should be allowed. The interval between operations may vary from

PURPOSE OF STUDY MATERIAL AND METHOD

Purpose In 1939 one of us (Dockerty 6) collaborated in reviewing the pertinent clinical and pathologic data in the record of 33 cases of granulosa cell tumor from the files of the Mayo Clinic. Since a further study of approximately 350 miscellaneous ovarian tumors revealed some cases that had been overlooked in preparing the 1939 report a well as some subsequent case re-examination of this subject seemed to be worth while especially in view of what we have learned in the last half decade concerning this type of ovarian tumor.

Material The material which forms the basis for this report consists of 6 cases of granulosa cell tumor encountered at the Mayo Clinic between 1910 and 1944. As previously mentioned 33 of these cases were reported in 1939. The tumors had been removed surgically or had been encountered at necropsy. In 44 cases the uterus with its endometrium was available for study and in one additional case simple curettement provided material for a study of the endometrium. All the specimens had been preserved in formaldehyde.

Method Gross pathologic studies of the tumors first were carried out with particular attention to location, size, color, consistency, degree of encapsulation and so forth. The contralateral ovary was studied for the presence of mature or developing follicles and corpus luteum. The uterus were inspected for enlargement and fibromyoma. The thickness and character of the endometrium were noted. A careful search was made for polyp and small carcinomatous remnant which previously might have escaped detection.

Multiple blocks of tissue then were cut from the tumor, the contralateral ovary, the uterus and the endometrium and these were placed in a fresh 10 per cent solution of formalin (1 per cent formaldehyde). Numerous section next were cut on a freezing microtome and stained with chrome methylene blue in an effort to record which blocks were to be treated by special method. The blocks subsequently were stained routinely with hematoxylin and eosin. Gomori stain for reticulum and Pearse III

stain for lipoid. Section stained with hematoxylin and eosin were considered satisfactory for a study of the uninvolved ovary and the blocks of myometrium and endometrium. Both the freezing and the paraffin method were employed in all instances. Larger blocks of tissue were removed from four tumors for determination of lipoid. These blocks were taken from one luteinized and three nonluteinized tumors for purpose of comparison.

By way of further comparison portions of seven normal ovaries were analyzed in a similar manner after care had been taken to avoid including such structures as developing or mature corpus luteum whose high content of lipoid might nullify comparative results. The lipoid content was determined from an alcohol-ether extract. For the estimation of cholesterol and cholesterol esters the method of Bloor and Knudsen was employed. The determinations of phospholipid were made according to the method of Youngburg and Youngburg.

CLINICAL DATA

Incidence Sixty-two (1.63 per cent) of the 3500 ovarian tumors encountered at the Mayo Clinic between 1910 and 1944 were of the granulosa cell type. Szathmari found an incidence of 0.9 per cent in a similar large series. Schroeder believed 3 per cent of all ovarian neoplasms were of the granulosa cell type.

The age of patients in the 6 cases ranged from months to years, the average age being years. The first and second and third decades each accounted for 1 case. The fourth decade accounted for 6. In the fifth and sixth decades were 1 each. The first and second patients respectively. Four patients came within 10 years of age. One tumor (16.7 per cent) occurred during the first decade (3 patients) during the reproductive period 18 (66 per cent) could be classified as occurring in the postmenopausal period.

Marriage The frequency of marriage in 6 patients was marriage and 8 were non-married. Of the married patients (2 patients) were related to the incidence of infertile

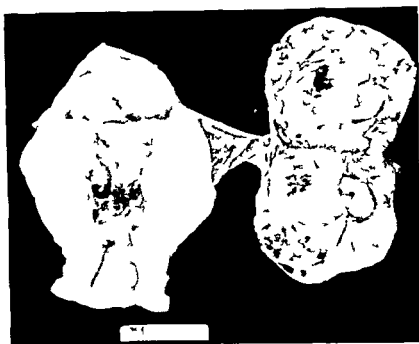


Fig. 1. Patient aged 55 years. Granulosa cell tumor of the ovary. The tumor is shown in two views. The left view shows the gross specimen, and the right view shows the histological section. The tumor is characterized by its lobulated appearance and granular texture.

tility is somewhat higher than in an average group of married women. After surgical removal of the granulosa cell tumor 3 of the 12 patients became pregnant. Of the 42 women who had had children 15 were multiparas and 7 were primiparas; the total number of children was 108. Thus it would seem that parity of the women might have been influenced. Conversely, however, it appears that parity has no influence on the development of a granulosa cell tumor.

Previous operative procedures. Operations had been carried out elsewhere in 18 cases. In 7 cases unilateral oophorectomy had been performed for some type of ovarian neoplasm; the exact nature of which could not be determined from the record, and the diagnosis of recurrent granulosa cell tumor was not considered until the ultimate outcome indicated such a likelihood. In 8 cases uterine curettage had been performed at intervals ranging from months to 7 years previously. Two patients had undergone hysterectomy, one for uterine fibroid myoma and the other for menorrhagia. The eighteenth

patient had had bilateral radical mastectomy for carcinoma carried out 6 years and 13 weeks respectively prior to registration.

SYMPTOMS

Uterine bleeding. This symptom was present in 46 of the 66 cases (74 per cent) and represented the most common complaint.

In the one case in which the patient was of prepubertal age, periodic vaginal bleeding had occurred at the age of 17 months.

Of the 3 patients who were considered to be in the reproductive period, 13 suffered from menometrorrhagia of varying duration. Perhaps of more interest was the fact that in 10 of these 13 cases the bleeding had been preceded by episodes of amenorrhea lasting from 1 to 7 years. Szathmari¹⁰ too noted that in 45 per cent of sexually mature patients the granulosa cell tumor apparently had caused an initial period of amenorrhea. One patient of menarcheal age complained only of light menorrhagia.

In the group of 38 patients who had passed the menopause, bleeding was present in all



Fig. 1. Left: Edema of the tumor cells, grossly in Fig. 1. Right: Mitotic figures in the tumor cells. (H. & E., $\times 57$). Diff. cell count (H. & E., $\times 60$).

case. The bleeding occasionally tended to imitate menstruation occurring at fairly regular intervals ranging from 1 to 5 weeks. The discharge often was described by patients as resembling menstrual flow. It was seldom profuse or of long duration. Three of the 38 patients gave histories of premature menopause; these may represent examples of an initial amenorrhea resulting from the tumor.

One 70-year-old patient had had her last menstrual period at the age of 11 years. More or less regular vaginal bleeding occurred when she was 66. A 6-year-old patient who had had irregular vaginal bleeding for 1 year described a period of amenorrhea between the ages of 1 and 40. A 4-year-old patient who had had vaginal bleeding for months had had amenorrhea between the ages of 1 and 35. A period of irregular bleeding had ensued but had ceased after administration of a menopausal dose of roentgen therapy at the age of 14.6. The possible duration of the granulosa cell tumor in these 3 cases—namely, 6 and 1 year—is not inconsistent with the nature of these lesions. In the 1939 report from the literature a case was cited in which the known duration was 1 year.

Amenorrhea. Of the 3 patients of menstrual age 5 (22 per cent) complained of amenorrhea lasting from 1 to 7 years. The amenorrhea was not followed by bleeding as described in the foregoing paragraph. Five of the 23 had normal menstrual histories. A count of all patients who had complained of amenorrhea at some time excludes those whose granulosa cell tumor undoubtedly developed late in life showed that amenorrhea occurred in 18 of 26 patients.

Abdominal enlargement. Fifteen of the 6 patients (9 per cent) complained chiefly of abdominal enlargement or tumor. Two additional patients regarded this symptom as of secondary importance. The duration of the abdominal enlargement ranged from 11 days to 11 years and in the majority of instances its growth was described as slow.

Pain. Although pain was a symptom in 23 cases it was the major complaint of only 3 patients. Rarely severe it was most frequently described as a bearing down or tight feeling on the side of ovarian involvement.

Miscellaneous. Complaints such as urinary incontinence and dribbling, falling of the womb, and so forth occasionally were



Fig. 3. Left: Cylindrical follicle type granulosa cell tumor, showing a central area of necrosis or hemorrhage. Right: Follicular type granulosa cell tumor, showing a central area of necrosis or hemorrhage. (H. & E., 100X.)

noted. Two patients complained of tenderness in the breasts.

PHYSICAL AND LABORATORY EXAMINATIONS

Physical findings. In 43 of the 6 cases (69 per cent) an adnexal tumor presumably ovarian was present. In 14 cases the presence of a large uterus with or without fibromyomas was suspected. In several cases large fibromyomas made accurate palpation of the adnexal regions impossible. In 3 cases no pathologic lesion of the pelvis was palpated; operation being undertaken mainly because of persistent uterine bleeding. Mammary hypertrophy had not been noted but in one case bilateral radical mastectomy had been performed because of carcinoma.

Laboratory findings. No preoperative endocrine studies were performed. In the case of a 7-year-old woman who had a granulosa cell tumor, determinations of urinary estrogen were made during the first 48 hours postoperatively. During the first 24 hours 8 rat units of estrogen were excreted in each liter of urine. None was found during the second determination. The drop in the level of urinary estrogen corresponds with the findings of other investigators.

One fairly consistent laboratory finding was a low value for hemoglobin; the average value being 11 grams per 100 cubic centimeters of blood. Readings as low as 5 grams were obtained in several cases. This observation was consistent with the clinical symptom of uterine bleeding but was not actually specific as an aid in differential diagnosis.

The results of lipid analysis of tumor tissue are recorded in a subsequent paragraph.

PATHOLOGIC DATA

Macoscopic findings. Location. All 6 tumors were unilateral, with the right and left ovaries sharing an approximately equal incidence of involvement. None was of extra-ovarian origin (3/33/41).

Size. The largest tumor weighed 34 pounds (15.4 kgm) and measured 40 centimeters in its greatest diameter; the smallest measured 4 millimeters in diameter. No apparent correlation existed between the age of the patient, the size of the tumor, or the duration of symptom.

Color and consistency. The color of the tumor ranged from a light cream color to a brownish black; the most common color

size Twenty five per cent of the tumors were grossly edematous Yellowish orange regions suggestive of luteinization were present in about 5 per cent of the tumors (Fig 1)

Encapsulation Although adhesions were present in 13 cases (1 per cent) and often were associated with twisting of the pedicle all tumor except 3 were fairly well encapsulated One of these tumors had extended into the fallopian tube on the same side another had extended into the terminal portion of the ilcum and the third had infiltrated the broad ligament Clinical malignancy was correlated with lack of encapsulation

Ascites In 6 cases moderate to large amounts of free fluid were present in the peritoneal cavity In one of these cases fluid also was present in the chest (Meigs syndrome caused by granulosa cell tumor rather than ovarian fibroma) Ascites was not found in association with small tumors and it was our feeling that as with fibromas (8) the presence of free peritoneal fluid was related to obstructed circulation (edema) within the tumor or its pedicle

Associated pathologic lesions Of the many pathologic lesions associated with granulosa cell tumor the high incidence of uterine fibromyoma and of uterine hypertrophy (subinvolution) is noteworthy (Table I) The observation also has been made by other investigators The presence of fibromas and hypertrophy together with the occurrence or reactivation in one case of extensive endometriosis with a large fatty cyst in the normal ovary may be viewed as an interesting manifestation of hyperestrinism The simultaneous occurrence in 8 cases (13 per cent) of a so-called adenocarcinoma of the uterine fundus is indeed surprising and cannot be explained adequately on the basis of chance There were 3 cases of mammary carcinoma

Microscopic findings Inasmuch as the microscopic appearance of granulosa cell tumor repeatedly has been described in the literature no attempt at detail repetition is necessary Follicular cylindroid diffuse and pseudoglandular cell patterns were all represented in our series The follicular

TABLE I—PATHOLOGIC LESIONS ASSOCIATED WITH GRANULOSA CELL TUMOR IN 62 CASES

Pathologic	Cases	Percentage
Uterine fibromyoma	3	51.6
Uterine myohypertrophy (leiomyoma)	37	59.6
Adenomyosis	5	
Endometrial hyperplasia		9.6
Carcinoma of the endometrium	8	9
Cervical carcinoma	3	37.1
Cervical polyp		1.6
Endometrial polyp		1.7
Tubal carcinoma (including tubal dysplasia)		1.6
Dysplasia of the ovary (27)		1.6
Fibromyoma of the ovary		6
Cystadenoma of the ovary		6
Leiomyoma of the ovary	1	1.6
Bilateral ovarian carcinoma	3	4.8

patterns predominated in 15 tumors (24 per cent) the cylindroid with all its variations in 30 tumors (49 per cent) and the sarcomatoid in 17 tumors (27 per cent) The sarcomatoid group which included the 3 cases in which clinical malignancy was evident appeared to be the most active type from the standpoint of cellular division (mitosis) The pseudoglandular arrangement of cells was found in scattered regions that were predominantly cylindroid in no instance was it the only pattern observed Luteinization of varying degree was evident on gross and microscopic examination in about 5 per cent of tumors The cells in these regions had lost their basophilic staining and had become loaded with lipid substance which stained intensely with sudan III (Fig a) This luteinization appeared to be reflected in the endometrium in 2 cases in which changes of a secretory nature were present (Fig b) This is perhaps indirect evidence that the luteinized granulosa cell tumor produces progesterone in addition to estrogen but actual biologic proof of this phenomenon is still lacking

Using Broders' method of grading the tumor was graded 1 in 45 cases (73 per cent) and 2 in 17 cases (27 per cent) Four of the 5 so-called recurrences were of a higher grade of malignancy than was the original lesion

Twelve (19 per cent) of the tumors presented microscopic features of combined

granulosa cell tumor. The fourth patient is alive 7 years after operation for a so-called recurrence in the contralateral ovary. The fifth patient died 19 years after operation. Although we have no actual proof of recurrence her case was so listed because of a history given by her family of recurrent vaginal bleeding prior to death.

From the relatively high incidence of clinical malignancy as evidenced by recurrence of the neoplasm in postmenopausal patients it would seem logical to advise total hysterectomy with bilateral salpingo-oophorectomy for granulosa cell tumor. Among 45 patients of all ages who received this latter type of treatment there were no recurrences. In the literature the recurrence rate for granulosa cell tumor varies from 4.5 per cent (von Pallo 100 cases) to 5 per cent (Novak and Brawer 3 case).

Conservative surgical procedures were carried out in 5 cases in which the patients were less than 4 years of age. There were no recurrences in this group and 3 of the patients subsequently became pregnant. Although this portion of our series is small, it is our impression from reading the literature that conservative operation is a safe procedure for young women when the granulosa cell tumor is well encapsulated.

Irradiation In the experimental animal (mouse) granulosa cell tumors have been produced by the use of roentgen ray. The question might therefore be raised as to what stimulating effect intrauterine radium theoretically might have on the ovaries of women later found to contain granulosa cell tumor. In 6 of our cases radium had been employed in the treatment of postmenopausal bleeding. In several instances cessation of bleeding indicated that the radium did not cause a tumor but had a definite retarding influence on a pre-existing granulosa cell tumor. One of these cases was reported previously by MacCarty and one of us (Dockerty, 4). The pertinent detail of another case follows:

A l d m l t p a r h a l h i
m r h f s r s f t h b u r t h e c d
c h i l d a t t h e e f 3 M m t r o n a a b e n
b a s t b r s f d c o t e d f s

y ars At th e f 46 pel c t mor which a
d agn ed n b r o r m p p e a d R e t r e
th rap a i m t l m a t c a l c u l a t e d
t p o d c a t t l m n p a u A c c o r d t
th pat t th b l e e d t p p e a d d the t u m
d e c r e a d s S a r s l t e r th b l e e d
r e c r r d n d p t t h c l c a g r l s a
c l l t m r s s r e d Th g e o f d n th
t i d c a t e th e c e s t f r m o a l of th
u t r u n d the c t r a l r a l a r y A c c o r d f
r o t t t h e r p y a g p o t p e t l y f
y r s l t e r e c u r t g r a c e l l t m o r w a
m e d f r o m the m t r y f t h m l l t e s t
b t i p t e of th s p e r a t n a d a t h d c u r s f
r o e t t h r a p t h p t t s f f d t h
r r r h h c l e t h c a y a r s l t e

This case illustrates retrogression of a granulosa cell tumor with control of postmenopausal bleeding for a period of 6 years as a direct result of roentgen therapy. On the other hand roentgen therapy failed to prevent recurrence of the tumor as was also true in the other cases in which the patients died from a similar recurrence. No definite claims can be made in 13 additional cases in which postoperative roentgen therapy was given. It is extremely difficult to evaluate the beneficial effects of irradiation in the case of a neoplasm which like the granulosa cell tumor possesses such a low incidence of clinical recurrence.

SUMMARY AND CONCLUSIONS

Sixty-two granulosa cell tumors were removed surgically at the Mayo Clinic between 1910 and 1944. This constitutes 1.63 per cent of 3,500 ovarian tumors encountered during this period. About 60 per cent of these tumors were found in women who had passed the menopause.

The most common clinical symptoms were uterine bleeding (4 per cent of 6 cases), amenorrhea (2 per cent) and abdominal enlargement (29 per cent). From a study of the record it was apparent that the tumors that produced these symptoms grew slowly and might have been present for as long as 3 years.

Urinary assay performed in the case of a man a few years before positive for 8 at unit in the concentration of urine excreted during the first 4 postoperative hours. The excretion of iron dropped to zero.

during the next 24 hours. Blood and urine assays should be performed in these cases both preoperatively and postoperatively to widen our information concerning the excretion of estrogen as well as to aid in clinical diagnosis.

Further evidence of hyperestrogenism is afforded in our series by symptoms of precocious puberty, amenorrhea, and postmenopausal bleeding, and is supported by the incidence of adenomyosis and endometriosis (9.6 per cent) which often occurred in postmenopausal patients, uterine fibromyomas (51.6 per cent), uterine hypertrophy (59.6 per cent), and proliferative endometrium (67 per cent).

Differentiative (secretory) changes in the endometrium were correlated in 3 cases with luteinization in the granulosa cell tumor. Luteinization without the expected endometrial change was observed in 12 additional tumors. Thus the deduction that granulosa cell tumors may produce the differentiative hormone progesterone is suggested. Efforts should be made to obtain biologic proof of this phenomenon.

The high incidence (21 per cent) of endometrial carcinoma observed in our 8 postmenopausal patients who had granulosa cell tumor was remarkable. In 3 of the 8 cases carcinoma of the breast with axillary metastasis also developed. This phenomenon of coexistent ovarian, endometrial, and mammary carcinoma in the human being bears a marked similarity to the results of experiments on laboratory animals in which estrogen stimulation appears to be a factor in carcinogenesis.

Pathologically the tumor appeared to be of a low order of malignancy as determined by histologic grading. They informed that the well established pattern of the high incidence of luteinization and a surprising number of cases (12) in which an admixture of granulosa cell and theca lutein cells existed. The distinction between the elements is usually made by the use of the method of staining results of the special stains, reason that equivalent in the average case of the tumor in the stain were a adequate for high the purposes. In cases in which the diagnosis is difficult

however, the impregnation method is helpful.

Chemical analysis of four granulosa cell tumors indicated an excess of cholesterol and cholesterol esters as compared to the normal content of these substances in the ovaries. In general this increase in lipid content was thought to be related to storage of estrogenic hormone. By contrast in our series the phospholipid content of the tumors was surprisingly low. Analysis of luteinized portions on the other hand revealed increased amounts of both substances.

In this group of 62 cases of granulosa cell tumor there were 4 definite recurrences and 1 possible recurrence. Conservative surgical procedures among postmenopausal patients accounted for 4 and possibly 3 failures to obtain good results. Thus 4 recurrences and 3 deaths occurred after conservative operations in the postmenopausal group. This appreciable incidence of recurrences among older patients indicated that bilateral oophorectomy with hysterectomy is advisable for granulosa cell tumors affecting women past middle life. Less radical procedures on the other hand seem to be indicated for granulosa cell tumor among younger women inasmuch as no recurrences were noted and pregnancy subsequently occurred in 3 cases.

Our experience with postoperative irradiation for granulosa cell tumors in postmenopausal patients is not sufficient to warrant recommendations concerning this mode of treatment. However we cannot state that such treatment might not be of value. Preoperative irradiation of the tumor may produce temporary regression with cessation of postmenopausal bleeding. If granulosa cell tumors are to be cured by irradiation apparently the dosage must be markedly increased if failed above the amount hitherto employed.

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A Cause of Brachial Neuralgia Which Simulates the Cervical Rib Syndrome

As a result of a large number of published articles and wide clinical experience the circulatory disturbances and neuralgias of the upper extremity which frequently result from cervical ribs or hypertrophy of the anterior scalene muscle are well understood. In 1916 Halsted was able to find 716 case reports of cervical ribs. It is not generally appreciated however that a similar picture may be produced by a congenital abnormality of the first thoracic rib. We are taking this opportunity of reviewing the literature and adding 10 new examples of this little known anomaly. Five of these have come to operation for relief of specific complaints while 5 others have remained wholly asymptomatic. Roentgenograms are reproduced of 8 of the 10 cases to illustrate different varieties of the deformity.

Judging from the lack of general knowledge concerning first rib anomalies their existence should be extremely rare. This however is not the case. As long ago as 1912 Wingate Hall (63) reported that variations in the shape of the first rib were very frequent. While such deformities have been encountered repeatedly by anatomists and have been described as dissecting room curiosities, and in recent years have aroused the attention of a few radiologists, they have not received the

The first unmistakable anatomical report of this malformation has been attributed by Dow to Hunauld. In 1740 he communicated to the Royal Academy of Sciences in Amsterdam a memoir (2) on variations in the number of ribs. He described a portion of an adult skeleton in which the first rib on each side well formed posteriorly and articulated with the first dorsal vertebra became blended with the second rib which was by the union much larger than usual. This anomaly must be very similar to that which is illustrated in our third and fourth case. Dow also cites the early dissecting room findings of Knox Sandiford Turner (67-68) and Struthers all published prior to 1875. The earliest review of the literature which we have been

able to find was written by Arbuthnot Lane (34) in 1885. Ten years later Helm described 16 cases which he had been able to find between 1853 and 1885. Keen added more of his own and 19 other references were cited by Jones in 1910. Most of these are descriptions of anatomical and postmortem dissections and contain no account of clinical symptoms or operations. In the past 5 years cases have been reported by Hvoslef, Clerc, Didier and Bobrie, Brickner and Milch, Jaubert de Beaujeu and Rollin (29-30), Bruett, Remijnse, Carroll, Gladstone and Wakley, Levi, Henry, Lindgren, Adson and Allen and Walshe, Jack and Wyburn-Mason. A few other references have been given in the papers which are not included here. Many of these more recent writers report cases of patients that have come to operation.

Brickner and Milch (8) in an article which appeared in this journal in 1915 and Walhe and associates in a description of 3 cases which reached this country while this paper was in preparation have given particularly valuable presentations of this subject. We have taken the liberty of quoting extensively from these two excellent reports. As far as Brickner and Milch could determine the credit for having recognized and described the production of symptoms by an abnormal first rib should go to W. W. Keen. One of his two cases, report of which was published in 1907, was in a 1 year old man with the history of a long standing mass in the neck and a 4 month old brachial neuralgia. Roentgenograms showed that on the left side the first rib instead of curving forward from the spine as does the right, changes its direction at its articulation with the transverse process and thence runs almost in a straight line downward and outward. The tip of it is lost at the point where the first rib and the clavicle cross each other. No operation was performed on either of Keen's patients.

ANATOMICAL VARIANT OF FIRST RIB AND THEIR PROTOTYPES IN LOWER ANIMALS

The first thoracic rib may show a great variety of malformation. These comprise rudimentary floating and bicipital ribs, central defects bridged by ligamentous bands,

exo-to-e and elongated jointed structures such as are illustrated by Brickner and Milch and by our Case 5. Correlated skeletal variation among the lower animals and embryological causes of malformation in man both contribute to our knowledge of this subject. Dr F. T. Lewis, professor emeritus of comparative anatomy at Harvard University, has been of the greatest help to us in the preparation of the brief summary which follows.

Variations in the development of the upper rib may be subdivided into three principal groups:

1. *Failure of the ribs to reach the sternum.* Hanlon has pointed out that in vertebrates as far back as the shark the number of ribs which reach the sternum varies from zero to a large number. All the ribs may never connect with the sternum as in various fishes and the frogs or a series of them may reach the sternum with floating ribs both above and below. This is true of birds (Stresemann) and man where with the normal floating lower ribs there may be anomalous cervical and 11 formed first ribs. In the earliest stage in both the pig and the cat continuity is lacking between the first and second ribs and the sternum (Whitehead and Waddell). In man the rudimentary first ribs form a synostosis or pseudarthrosis with the second, the type of bicipital rib described in whales by Turner (67). In these cases the junction of the ribs is usually close to the point of insertion of the anterior scalene muscle and the crossing of the trunks of the brachial plexus and subclavian artery (Jones). Instead of fusing with the second the first rib may sometimes bend at the level of the ulcus (Brice) or have an unusually high position (Keen) or remain floating in the soft tissues at the base of the neck (Keen, Trier). Such floating ribs may have a ligamentous prolongation joining them to the second rib or the sternum (Todd, 6). Dwight, at times the ligamentous portion again becomes bony and articulates with the manubrium (Dow).

The division of ribs into vertebral and serratus portiones. Division of the ribs into vertebral and serratus portiones, the Eurapophyses and hemapophyses of Owen's



Fig. 1. Geog. W. KOTC. N. y. N. S6. 044. 1 ft R t th k gr h w g m l j p e f first bs t N y fl t k se l eek lat be use fp ngt p l l f sa b h fl d

bl th houl This il t t th ty al tes fra t f th first rib described by All ro A po t t l t re f t g f scal t b l

archetype skeleton is characteristic of lizards, crocodiles, birds, and mammals (Lower Stresemann Ickhan). In mammalian ribs may be more or less calcified while in archaello they are well ossified and articulate by synovial joints with the sternum and vertebral ribs. These are comparable to the human first rib with a central ligamentous portion as described by Dow and to the articulated ribs which are described herein. Helm has put forward the theory that such an articulation in a rib may be a compensatory mechanism to provide sufficient respiratory excursion of the chest in case of abnormal symmetry with the rib below.

Clinical and radiological descriptions of jointed ribs have been published by Vinogradov who encountered this anomaly in 6 cases of cervical ribs also by Litter and Halbermann. In the first thoracic rib this anomaly has been described by Iuchka Lane (a) Seamon, Bricker and Milch (b) Remijnse Jaubert d. Bauj u and Kollin (20 10) and Walbe and Lasserre. In the last three articles four of these first rib anomalies are illustrated where the articulation is further lateral and there is only a short length of the first rib beyond the joint which fuses with the second as a bony spur. Walbe and his colleagues have claimed this malformation as an extension of the second rib but in some of these cases the bony projection is long and closely resembles the outline of a rib that

it has seemed more logical to us to consider the anomaly as a jointed first thoracic rib. Some writers have claimed that this condition is due to an old fracture of an abnormal rib but no accounts of significant injury have been recorded (Litter). So-called stress fractures of the first rib have recently been reported by Alderson but these as illustrated in Figure 1 appear as simple breaks in the continuity of an otherwise normal rib and in no wise resemble the congenital anomalies here described. In these cases also a history of severe trauma is usually lacking. Kochler (quoted by Alderson) has stated that fractures of the first rib are extremely rare and are generally spontaneous fractures due to muscular contraction. They should not be confused with developmental abnormalities of the first rib. We have been extremely skeptical about the traumatic etiology of these so-called stress fractures but one of us (M.H.) has recently had occasion to compare a routine chest film in a young naval cadet (Fig. 1 a) with a film repeated several weeks later because of upper extremity pain which followed a heavy blow on the humerus. This second roentgenogram (Fig. 1 b) shows the type of fracture described by Alderson and present clear cut evidence that it can occur as a result of trauma. It is therefore possible to theorize that such a fracture could occur in the type of an malformed first rib illustrated in Figure 1 c and as the result of non-



Fig 5 \ y p t f C 3 h g l t l
ly f f t th l 1 h d ribs b
ly b a l ed d th l 1 light se los th
t pe tth f tth t b Tl tral po t
fth nl th l fth bee e s e d t t th hosp t l
lea g 3 t t ent l t j f t g f m th
t rse l x d l g b o j l beh l th
l l t t h i t th se l l (j k l t d t d
l)

as a rule by the inclusion of the second thoracic nerve in the brachial plexus (Fig 2). This has also been emphasized by Hurt and Keith and by Dow, although the latter has pointed out that the rib may end at some distance lateral to the crossing of the nerve. In those cases in which a seventh cervical rib is unusually well developed the first thoracic nerve often fails to join the plexus at least in its normal bulk, and it is probable that different degrees of development of cervical ribs show the effects of varying contribution from that nerve. Cervical ribs are therefore liable to occur with a prefixed type of brachial plexus while an malum first rib are found when the second thoracic nerve is an important component in posterior fixation. Sargent who has described absence of a first thoracic contribution to the brachial plexus encountered in the course of resecting a cervical rib, suggested that this anomaly is more common than a prefixed one. Walsh and colleagues agree that a rudimentary first rib is normally associated with a large contribution of the second thoracic root to the brachial

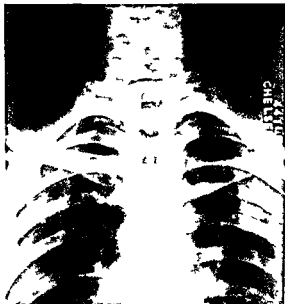


Fig 6 \ y p t f C se 4 h g y t t
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rm l first rib m g ft l t e s e c t t
th hospital Th ce tral t p ea sed y n j t by
p j u g g u t th b h l f l f beh l Tl
se d rib lso lightly d f ed d b d d bel
th po t f t eul t t t th first.

plexus but state that an added cervical rib is not necessarily related to a prefixed plexus. Wingate Todd (6) add confirmatory evidence to this theory by finding that the



Fig 7 \ y p t f Case 5 Th first t th
l f b rm lly long nd l es th t l t
l l d t se gl Th t l j l b l th
l l l h l t l port t l l j l d t
gl d so deg res t f se th br a l ned sec l l

Neither of these theories can account for the occasional appearance of a bicipital rib below the first thoracic segment. In the Radiological Department of the Naval Hospital there is a routine chest film in which the second rib ends at the midaxillary line and fuses with the third whose shaft is considerably broadened at this point. This suggests that any of the upper ribs if they fail to reach the sternum tend to become attached to the rib below and by the resulting fusion form a bicipital rib.

It is worthy of comment that with abnormal first ribs as is also the case with cervical ribs and the scalenus anticus syndromes symptoms are rarely encountered before the age of twenty. This has been explained by Todd (66) in his account of the descent of the shoulder after birth. Since the upper limb develops at the level of the seventh cervical segment the first and second thoracic nerves must first run upward until they have crossed the uppermost rib and then angulate downward to enter the arm. Because of this arrangement any elevation of the rib or depression of the shoulder must stretch these lower connections with the brachial plexus. Todd has shown that in the course of normal skeletal development there is a gradual descent of the shoulder with advancing years. This tendency is of course exaggerated when the individual carries any heavy weight and is reduced when the weight is taken off the arm by supporting the elbow in a sling or on the arm of a chair. It is just these maneuvers which frequently result in exacerbation or relief of symptoms (see the clinical histories herein reported).

In addition to the disturbances caused by a congenitally deformed rib brachial neuralgia has been ascribed to pressure irritation of the lowest roots of the brachial plexus by an apparently normal first thoracic rib. Numerous examples of this condition have been described by Buzzard, Bramwell and Dyles (56), Stiles, Murphy, Morley, Stopford and Telford, Wheeler and Brickner (7). Many of these patients were relieved by resection of portions of the first rib but all were reported prior to the classical paper of Adson and Coffey (2) which appeared in 1917 and

brought out the rôle of the anterior scalene muscle in compression of the brachial plexus in the presence of a cervical rib. In view of Naffziger's (46) description of the anterior scalene syndrome in which brachial neuralgia is found in the presence of an apparently normal first rib it is our impression that the cases were probably examples of this condition and would have been relieved with equal success by scalenotomy. A few may have even masqueraded as protrusions of lower cervical intervertebral discs which may easily be mistaken for the scalene syndrome and probably account for some of the failures of scalenotomy. Very recently Walshe, Jackson and Wyburn-Mason have claimed that compression of the brachial plexus and subclavian artery may be produced by the clavicle as it approaches the first rib in cases of extreme sagging of the shoulder.

Granted that a significant deformity exists at the thoracic outlet the onset of symptoms frequently depends on some form of trauma to the shoulder girdle. A large proportion of the reported cases of anomalous first or cervical ribs with brachial neuralgia or vascular disturbances have occurred in service personnel soon after induction. Many of these men who have been leading relatively sedentary lives first develop symptoms after carrying a heavy pack or weight on the shoulder or following a sudden muscular strain. Four out of our five cases with brachial neuralgia are in Naval personnel and one of them (Case 4) noticed the onset of his neuralgic pain following trauma.

SYMPTOMS PRODUCED BY MALFORMATIONS OF FIRST RIB

Symptoms and signs produced by congenital deformities of the first rib fall into three main groups:

1. *Local* These include bony projections in the supraclavicular fossa which can be felt and sometimes seen. Often the subclavian artery lies in an abnormally high position in the neck and sometimes its pulsations are visible beneath the skin. The bony deformity is often a cause of vascular or neuralgic symptoms when the rib ends at the scalene tubercle which is unfortunately the

most common arrangement. Here it may form a synostosis or pseudarthrosis with the second rib and its termination may be expanded by a prominent capsule. More rarely it continues as a band of fibrous tissue to its normal attachment with the sternum or ends as a bony tip in the soft tissues. In an unusual complication described by Henry the sharp free end of the rib was a cause of intermittent pneumothorax.

Vascular. Circulation in the arm is often reduced. This may be apparent at a glance when the hand is discolored and very cold, particularly if trophic disturbances are present. The radial pulse may be absent but often it is necessary to compare the blood pressure in both arms while downward traction is made on the affected side or the patient rotates his chin in this direction, throws his shoulders back and takes a deep breath (Adson and Allen¹). Brickner and Milch and also Walshe and colleagues have reported cases with an arterial bruit. Reduced circulation in the arm has been ascribed by Todd (6), Stopford and Telford and Wilson to the irritation of sympathetic fibers in the lowest cord of the plexus. Walshe and his colleagues have described a patient with an associated Horner's sign and loss of sweating of the right face, neck and upper extremity. As these observers pointed out it is obvious that the rudimentary first thoracic rib in this case must have produced a sympathetic paralysis, not of peripheral origin from compression of the plexus but from injury in the region of the cervicothoracic ganglion which carries sympathetic fibers destined for the head as well as the upper extremity. To account for the common reduction of circulation seen in the arm one would have to assume an irritative action on the sympathetic axones in the brachial plexus which should be accompanied by hyperhidrosis and possibly pilomotor disturbance in addition to vasoconstriction. Neither we nor any other writers have observed these manifestations with either cervical or abnormal first thoracic ribs. Furthermore as Sir Thomas Lewis (3) has shown neurogenic constriction of the arteries is never sufficiently intense to obliterate their pulsations.

In short as Walshe and colleagues have summed up the argument it seems clear that there are no grounds upon which we can reconcile coldness, cyanosis, pallor and tingling of the hands with involvement of sympathetic fibers and that there are many grounds upon which we must relate them to compression of the subclavian artery. When this is severe and long continued intimal changes may occur and result in local or widespread thrombosis. This has been described in first rib anomalies by Russell, Bruett, Kennedy, Lindgren, Adson and Allen (1) and Walshe and his coauthors. Among the clinical histories of the peripheral circulatory clinic and the private wards of the Massachusetts General Hospital there are 2 cases of cervical rib in which thrombosis appears to have broken off and caused emboli to lodge in the brachial and digital arteries.² Lewis and Pickering (39) and Walshe and colleagues have recorded similar complications. This may well have been the case in Lindgren's patient with an anomalous first rib and subclavian aneurysm at this point as the brachial artery was occluded in the mid upper arm. Venous constriction and the formation of collateral channels from compression of the subclavian vein by a normal first rib has been reported by McLaughlin and Popma and by Sampson, Saunders and Capp. The presence of a malformation in the first rib might well be present in this condition and should be sought for although to our knowledge no instance has yet been reported. This may be explained by the fact that most anomalous first ribs are rudimentary and end at the scalene tubercle before the point of crossing of the subclavian vein.

3 Neurological. Local tenderness on pressure over the prominent rib behind the clavicle with at times radiation of pain down the arm are frequently present. Sometimes the plexus can be rolled over the underlying bony prominence and tingling paresthesias produced in this way (Case 5). Numbness

In the 6 sections of D. H. F. 30 sections of the occluded portion of the brachial artery was performed prior to the removal of the rib. In 5 of these the first rib was primary cause of occlusion was embolus. In 1 of these the embolus was removed by the microscopic sections, in 4 of these there was no evidence of any embolus. The following are much more apparent evidence of the local process of thrombosis.

may be present in the more severe cases or when the shoulder is drawn down by lifting a heavy weight. Such sensory changes may be only subjective. When objective pathologic sensibility is more likely to be reduced than epicritic (Wilson). It has been stated that in the cases the pain is not as likely to be limited to the distribution of the ulnar nerve as in the case of cervical rib or scalene compression. This however is not always true as cases of cervical rib have been reported by Dejerine and Wilson in which pain was referred to the lateral side of the hand. Swank and Simeone have reported a number of instances of the anterior scalene syndrome in which pain referred to the upper plexus distribution was relieved by scalenotomy. The most complete description of neurological changes in the arm due to an abnormal rib has been given by Kinnier Wilson. He pointed out that the neuralgic pain, paresthesias and muscular weakness may be limited to the ulnar area or involve the thenar eminence and radial side of the hand and forearm. To account for this he has pointed out that the medial head of the median and the ulnar nerves have a common origin from the eighth cervical and first thoracic spinal nerve roots. Walsh and colleagues have stated that nerve compression like arterial need not be produced at the sulcus nervi brachialis. If it occurs more peripherally as when the clavicle squeezes down on the deformed first rib other portions of the sensory and motor outflow to the arm may be involved. In addition to the sensory manifestations motor weakness with wide areas of power in the arm may be present and atrophy of the arm and intrinsic hand muscles has also been reported in no wise different from the paralytic seen with cervical ribs. Loss or reduction of reflexes is an additional sign. The reduction in motor power may be secondary to impaired circulation as well as to direct paralysis of motor nerve fibers (Lindgren and our Case 1).

We have been unable to differentiate congenital abnormalities of the first rib from cervical rib or compression of the anterior scalene muscle on the basis of clinical symptoms or physical examination. A similar

conclusion has been reached by Walshe and colleagues. The sensory disturbances may be somewhat more widely distributed in the former condition but this is not definite enough to be counted on. Even with an ordinary anteroposterior x-ray picture of the cervicothoracic spine bilateral malformation of the first thoracic ribs can easily be mistaken for cervical ribs as the mandible hides the upper cervical vertebrae and it is not possible to count down from the atlas to identify the first thoracic segment. A lateral film is not too helpful because it is often difficult to define the exact vertebra to which the uppermost rib is attached. It is essential to be able to outline all the vertebrae in the neck and upper thorax on an anteroposterior film which shows the details of the upper rib articulations as well. This can be accomplished by making a long exposure with the patient opening and closing his mouth. In this way the shadow of the mandible is blurred so that it does not obscure the outlines of the atlas and axis vertebrae. Anteroposterior x-ray films should include the whole of the second as well as the first rib as the anomaly often involves the two. All of the bony structures bounding the thoracic apex require careful scrutiny. In unusual cases it may be advisable to include the entire spine so that the total number of ribs and lumbar vertebrae can be counted. Unless these precautions are observed first rib deformities will be missed. After an examination of skigrams reproduced in many articles which purport to illustrate typical cervical ribs we as well as Walsh and his colleagues have been impressed at finding that some have been misdiagnosed even by roentgenographers and actually represent malformations of the first thoracic rib.

While the presence of a malformation of the uppermost rib can often be diagnosed by the clinical evidence of a mass with compression of the brachial plexus or subclavian artery and its vertebral origin determined by roentgenography it is still important to make certain that it is the actual cause of the symptom. Other conditions which can give rise to nearly identical complaints are neoplasms of the superior pulmonary sulcus (40) cervical arthritis and herniation of one of the lower

cervical intervertebral discs. While such diagnostic errors could not be made in the presence of a large first rib deformity with evidence of postural arterial compression a concomitant disc herniation could easily be missed in the presence of a rudimentary first cervical rib and symptoms limited to neuritic manifestations. This complication could have been present in our Case 2 in which coughing, sneezing and turning of the head caused pain to radiate to the shoulder and arm. Under these circumstances lumbar puncture should always be performed and in addition a myelogram with opaque oil if the cerebrospinal fluid protein is elevated.

PERSONAL CASES

Our experience with malformations of the first thoracic rib comprises 10 cases, 3 of whom required surgical intervention for relief of neuralgia with superimposed thrombosis of the subclavian artery in the first patient. The other 3 had no specific complaints and were discovered in the routine examinations of thoracic x-ray films made for other conditions. The case histories of the patients upon whom operations were performed are given in detail below. Of the asymptomatic group roentgenograms of 3 which illustrate interesting variations of this anomaly are reproduced in Figure 8. The remaining 2 who had deformities resembling those already described are merely mentioned for statistical purposes.

CASE 1. Mrs. H. L. T., aged 35 years. Congenital malformation of first and second ribs on left with compression of brachial plexus and subclavian artery. Postoperative fixation of brachial plexus. No improvement after scalenectomy, but good result following a total resection of ribs and preganglionic sympathetic.

For months prior to her first admission to the Massachusetts General Hospital this woman noticed numbness in the fingers of her left hand. Gradually subjective hypesthesia developed in the hand as well as paresthesia after use. For the past 2 months she had complained of dull pain in which she could usually relieve by abduction of the shoulder. On admission a bony prominence was palpated in the preacromioclavicular fossa on the left and the subclavian artery somewhat more prominent than usual. In addition a wide, cordlike sub-ject hypesthesia observed that her hand was distinctly colder 2 or 3 times white on murex cyan than her right hand. Her right radial pulse was

at first weak normal. Blood pressure readings were 123/98 on the right 124/88 on the left. Skin temperature measurements brought out a red color of 12 degrees F in the left thumb and small finger and 17 degrees in the middle finger (room temperature of 68 degrees). Ergometer test showed a group of 50 kilo-grams in the right hand 60 in the left. Her general physical examination was not otherwise remarkable except for obesity. X-ray film which unfortunately was destroyed at the end of a 5-year interval was at first interpreted as showing bilateral cervical ribs. However, on closer study the number of ribs was found that there were only twelve pairs. The upper one on the right a complete rib and articulated with the sternum but the one on the left formed a pseudarthrosis with the middle of the second rib. A routine lumbar puncture was normal.

October 3, 1939, exploration of abnormal first rib and division of left anterior scalene muscle were carried out. After careful dissection and palpation it was evident that the anterior scalene muscle was unusually tense. When cut across its ends retracted widely and we felt that it accounted for at least in part for the irritation of the brachial plexus. There was no definite evidence, however, that the subclavian artery was compressed. The artery, unusually prominent and looped around the lateral edge of the muscle, but it pulsated normally. The deformity in the ribs was found to consist of a large pseudarthrosis with a thickened capsule where the underdeveloped first rib joined a hypertrophied second rib just beneath the point where it crossed by the artery and nerve trunks. As the myotomy seemed to have relieved all pressure on these structures no effort was made to remove the rib deformity. This procedure to be an error as late developments brought out.

Convalescence was uneventful. On re-examination 6 weeks later she had no subjective complaints but there was a small subcutaneous abscess in the third finger. All the fingers of the left remained cool and the color of this hand distinctly darker than the right. When next seen on February 29, 1941, she had no complaint but by the following autumn her original subjective symptoms had returned. In addition to the temperature and color changes in her left hand the radial pulse had disappeared and blood pressure readings were barely obtainable from the brachial artery. She was therefore advised to return to the hospital and was readmitted on October 22, 1941. At this time her fingers were not so cold as on her previous admission (only a dull ache) but she complained of disturbing numbness and aches especially after working. Again the numbness was particularly subjective sensation but pulsations in blood pressure readings could be obtained in her left arm. Tests to determine the rate of metabolic rate (compress ergometer test) 3 km 36 times a minute showed that contraction of the left hand could be continued for only 1 minute and so could be set for

severe pain: the muscles of the forearm which could be kept up: the normal right hand for 5 minutes and 5 seconds after which there was inability to do further work but no actual pain. When a tourniquet was applied to the right arm fatigue and pain occurred in 1 minute and 15 seconds.

October 28, 1940. Diagnostic paravertebral procaine block of the upper thoracic ganglia in the manner originally advocated by one of us (J.C.W.) resulted in a dramatic increase in temperature to the normal vasodilatation level but no return of the radial pulse. Her ability to flex her fingers at a constant rate against a given resistance was then compared with previous trials. Although the increased blood flow did not augment her capacity to work the onset of fatigue no longer brought on the painful claudication.

October 29, 1940. Subtotal excision of the left first and second ribs and preganglionic sympatheticotomy under intratracheal ether anesthesia were done. Exposure was facilitated by a wide semicircular incision with lateral retraction of the scapula. In addition to a subtotal resection of the fused first and second ribs, the central portion of the third rib was removed to obtain the most effective exposure for a preganglionic sympathetic denervation of the arm (73). In the course of the sympatheticomyotomy it was found that the patient also had a posterior fixation of the brachial plexus with a large second thoracic nerve which ran upward to join the plexus. We were therefore unable to carry out the usual resection of the roots of the second spinal nerve but had to content ourselves with a careful resection of its sympathetic ramification. It was removed at the second thoracic sympathetic ganglion.

Although the x-ray films are not large, a good idea of this unusual malformation can be obtained from Figure 3, a photograph of the specimen removed at operation. It is evident that we were dealing with a very large second rib joined by an abnormally small first thoracic rib. A posteriorly some 7 centimeters lateral to the costovertebral articulation.

When I first seen 17 days after this operation the patient had no pain: her arm or hand, in active movements and ergometer tests. Her left hand remained normal in color and distinctly warmer than the normal extremity although there had been no return of the radial pulse.

CASE 2. A 12-year-old girl, age 22 years, WT. 100 lb. Congenital malformation of first rib only, which fused with second causing irritation of brachial plexus. Partial relief following a thoracic sympathectomy.

This was the second episode of pain in the left supraclavicular region with radiation to the elbow and down the arm. It recurred with the exception of the thumb. At times when the pain was severe his neck became stiff and painful. Movement coughing and sneezing hurt. He had discovered that under these circumstances he was most comfortable lying on his back with his neck

straight and weight off his arm. The present attack had started 6 weeks prior to his admission and had again partially cleared. Eight months previously he had developed syphilis but after a full course of antiluetic treatment the Kahn reaction and spinal fluid examination were normal. His physical examination was not remarkable except for the finding of distinct supraclavicular tenderness over the insertion of the left anterior scalene muscle with a distinct bulge in this area. The subclavian artery was more prominent on this side than on the right. Blood pressure readings were the same in both arms and it was impossible to shut off his radial pulse by any maneuver. Although neck movements had formerly been painful they were free at the time of this examination.

The x-ray picture reproduced in Figure 4, disclosed a rudimentary first rib which joined the second 3½ centimeters lateral to its articulation with the transverse process.

Owing to the local tenderness at the origin of the scalenus anticus it seemed more logical to explore anteriorly although total resection of the rib would have required a posterior incision.

On April 12, 1941 supraclavicular exploration and anterior scalene tomy were done. There was considerable fibrosis around the lower end of the scalene which was mainly inserted into the second rib. The subclavian artery and lower portion of the plexus were compressed between the lateral border of the muscle and the end of the rudimentary first rib.

After a smooth convalescence with early physical therapy and swimming he was discharged to duty after 4 weeks. He returned for a check up after a 7-month period of sea duty complaining of intermittent bouts of less severe discomfort in his left shoulder. These were not continuous and very incapacitating. On being offered the choice between a trial of limited shore duty or resection of the rudimentary first rib he chose the first alternative. He did not feel that he had sufficient discomfort to require further surgery.

CASE 3. George R. aged 29 years, S. 1/c U.S.N. Bilateral congenital anomalies of first ribs with cervical and brachial neuralgia and partial compression of left subclavian artery. Postoperative return of left-sided pain due to incomplete removal of rib with residual bony spur. Two-stage removal of bony spur followed by pressure emprovement.

For the past year and a half this sailor had complained of pain in his left neck, shoulder and arm. Similar discomfort to a much lesser degree was also present on the right side. He had noticed a lump in the left supraclavicular fossa for several years. X-ray pictures taken at another Naval Hospital showed a bilateral congenital deformity of the first ribs. On the right side the rib was a mere rudimentary stump but on the left it measured some 8 centimeters in length and joined the second rib. The vicinity of the insertion of the anterior scalenus muscle. On March 3, 1943 the first stage of the

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tosis Just posterior to the clavicle and extending back toward its vertebral articulation the rib was elevated and unusually prominent. It was impossible to shut off the radial pulse by any maneuver but pressure against the bony prominence produced tingling paresthesias in the ulnar side of the hand. There were neither objective sensory nor motor paralyses.

The x-ray picture reproduced in Figure 1 visualized a most unusual deformity on this side where the first rib arose at a very obtuse angle and ran nearly in a straight line for 7 centimeters from its transverse process. Here at a point just behind the clavicle it ended in a distinct joint. Below this articulation the distal segment of the rib changed direction abruptly to run 3 centimeters directly forward and fuse with a broadened anterior portion of the second rib. The results of 8 degrees of angulation in the first rib lay directly beneath the brachial plexus. On the right side the ribs were normal. (For reports of other cases of jointed cervical and first thoracic ribs and theories of the origin see foregoing.)

On March 19, 1945 the supraclavicular fossa was deeply exposed by a transverse incision. The bony border of the clavicle which extended from the clavicular insertion of the sternocleidomastoid muscle and curved upward to the anterior border of the trapezius. The phrenic nerve together with a large accessory trunk was retracted medially and the thinned-out insertion of the anterior scalene muscle divided. After a wide exposure the blood vessels of the bony anomaly, arteries and nerves, were traced. The bone of the neck was carefully examined. It was then apparent that the posterior portion of the first rib came flat and unusually obtuse angle. The angle of the posterior of the mass prominence just behind the clavicle. Here the palpable bony mass was found to consist of a pseudarthrosis with cartilage covered bone but with limited mobility. The portion of the rib anterior to this ran obliquely downward beneath the clavicle to the second rib. The cords of the brachial plexus lay directly over the project joint articulation so that they were compressed and angulated by the underlying bone. At this point the space between the first rib and the clavicle was greatly narrowed so that the Walsh-Jackson and Wyburn-Mason theory of clavicular compression may well have played an important rôle. The cervical anastomotic branches of the left innominate artery which gave rise to the subclavian and common carotid arteries were off the internal mammary and transverse cervical arteries and ran thoracically where the subclavian vessels continued laterally to its usual point of origin. No transverse scapular artery could be seen. By careful manipulation the brachial plexus was retracted far enough medially to permit freeing up and cutting the rib 3 centimeters behind its point of fusion (at the insertion of the medial scalene). It was then a matter of freeing the attachments of the bone from the trachea and

pleura. The rib anteriorly was then resected away to the pseudarthrosis where it disappeared beneath the clavicle. When this had been completed its forward end dropped down leaving the small distal stump well clear of the plexus and covered with a smooth layer of cartilage. A rubber dam drain was left in the extensive dead space from which the section of rib was removed.

Beyond some tingling paresthesias which were present for a few days there were no sequelae to this extensive manipulation beneath the pleura. The drain was removed the day following operation and the incision healed uneventfully. At the present moment 6 weeks after the operation he is nearly free of his former symptoms.

The symptoms of mechanical irritation of the brachial plexus and compression of the subclavian artery caused by a congenital malformation of the first rib are exemplified by the 5 cases here reported. To illustrate some further variations of these abnormal ribs the x-ray films of 3 additional cases are reproduced in Figure 8. These together with similar deformities in 2 other examples were the cause of no symptoms whatever but were picked up by one of us (M.H.P.) in the course of routine examinations of chest films. This series of 10 includes all the common manifestations of this deformity which we have been able to find in published case reports. Of the concomitant malformations cervicothoracic scoliosis was present in 3 (Cases 3

and 8) while deformities of the second rib occurred in every instance. Of the more rare complications which have been reported aneurysmal expansion of the subclavian artery, venous congestion, vertebral anomalies, Horner's syndrome from sympathetic paralysis and spontaneous pneumothorax have not been encountered. That these deformities have been found in 9 males to a single female is without significance as all but one were in Naval personnel. In Case 3 the deformity was bilateral but in all 5 patients with actual neuralgia the first rib on the left was the cause of the predominant symptoms. This again is probably of no statistical significance as in other reported cases the incidence has been approximately equal on the two sides. Onset of symptoms following definite trauma occurred only in Case 4.

It is worthy of comment that we have encountered only a single malformation of the

first rib in a civilian during the past 5 years and that the others have all been in U S Naval personnel. In the first half of the series our attention was directed to the condition by neuralgic pain. Four of these deformed ribs were in sailors seen during the 11 months period ending in March 1943. As has so often been the case with other new medical syndromes as soon as the condition has been recognized and the attention of a large clinic focused upon it new examples are then found with increasing frequency. Within the past 2 months 5 additional asymptomatic cases have been discovered. We are convinced therefore that anomalies of the first thoracic rib are no greater rarity than cervical ribs. Their presence should be sought for by roentgenologists and their symptomatology recognized by surgeons and orthopedists.

A summary of the type of symptoms and signs found in our patients follows. Supraclavicular tenderness was noted in all but 1 supraclavicular bony projection in all. As to sensory disturbances neuralgic pain was noted in all subjective numbness in 4 objective sensory loss in only 1. Of motor paralyses muscular weakness was noted in 3 muscular atrophy in 1 reflex changes in 2. As to vascular changes the subclavian artery was prominent in all arterial compression in 1 but there was found no venous compression no irritation or paralysis of sympathetic fibers.

As to pain distribution in Case 1 diffuse pain was noted in the fingers and hand in Case 2 pain was noted in shoulder arm and second to fifth fingers in Case 3 in occiput neck shoulder medial forearm and third to fifth fingers in Case 4 in shoulder arm and radial side of hand in Case 5 in occiput neck shoulder biceps elbow and ulnar side of hand. This summary shows that the neuralgia from an abnormal first rib is unusually widespread. It was limited to the ulnar side of the hand in only 2 cases including also the shoulder and upper arm in 4 and the neck and occipital region in 1. How the cervical plexus can be involved is not known.

Motor weakness also seems to be rather diffuse. It was not limited to the lowest trunk of the brachial plexus and was not accompa-

nied by atrophy of the intrinsic muscles of the hand which are innervated by the ulnar nerve. Although the subclavian artery was forced upward by the underlying abnormal rib in all the 5 patients evidence of actual arterial compression was present in only 2. In Case 3 there was a slight postural occlusion of the radial pulse but in Case 1 the postural factor was at first pronounced and was later followed by thrombosis of the brachial artery. None of these patients had any evidence of sympathetic irritation or paralysis. In Case 1 sympathectomy restored an excellent blood flow by dilating the collateral channel although the thrombosed arteries remained occluded.

Mild cases of neuralgia due to a congenital deformity of the first rib may respond to orthopedic measures as is often the case in the scalene syndrome (Naffziger and Grant 4). These consist of improvement in posture, exercises to strengthen the trapezius and the other muscles which elevate the shoulder girdle and temporary support of the upper extremity by a sling arm of a chair or the recumbent position. Reichert has also described an arrangement of three pillows so that when the patient lies on his back the shoulders head and neck are forced forward. In the lateral position with the shoulder on the mattress between the two under pillows and the head on the third or top pillow this arrangement prevents lateral flexion or rotation of the cervical spine and thereby reduces compression of the plexus. In 4 of our 5 cases the bony deformity was such a definite cause of mechanical irritation that conservative measures did not appear to be worth a trial. Case 1 was referred to the orthopedic service but postural exercises proved ineffective. A period of conservative treatment might have been worth a trial in Case 2 where a second attack of brachial neuralgia was subsiding spontaneously but owing to the exigencies of a very active military hospital surgical exploration of the rudimentary rib and scalene myotomy were preferred. Following this review of the literature and personal experience with these cases it is our opinion that an abnormal first thoracic rib is likely to produce more severe mechanical

than is a cervical rib. This is because cervical ribs are so often more rudimentary structures, whereas anomalous first ribs are commonly lower and associated with greater deformities of the thoracic outlet (70). Advocates of treating cervical ribs by scalenotomy such as Adson and Coffey () and Patterson agree that when the anomalous rib extends forward to compress the brachial plexus and subclavian vessels it should be resected. This is generally the case with malformations of the first rib. As already mentioned Walshe and his colleagues have accounted for the frequent failure of scalenotomy in the relief of compressive symptoms on the basis of the mechanical role played by the clavicle. They have stated that the clavicle probably plays a far more significant role in the production of pressure symptoms in the presence of abnormal ribs than is commonly realized. This is particularly true in vascular disturbances where the clavicle and rib together constitute what we may call the vice in which the third part of the subclavian artery is currently gripped. This may well account for intermittent postural compression of the artery, aneurysmal dilatation and thrombosis or embolism. Such a mechanism may well explain the primary reduction in blood flow through the brachial tree and the final thrombosis seen in our first case. Here we were unable to determine the compressive rôle of the clavicle because we removed theicipital rib through a posterior incision. In our fifth case however there was a definite vice like compression of the plexus between the prominent jointed deformity of the first thoracic rib and the clavicle which was released by resecting this portion of the rib. Anterior scalenotomy alone was performed in our first two subjects followed by only brief benefit in the first and lasting but not complete relief in the second where the rib was unusually rudimentary.

On the basis of our experience we plan in future cases to adopt the following policy. If the patient fails to obtain satisfactory relief from conservative orthopedic measures exploration should first be performed through a supraclavicular incision. Maximum exposure of the rib can be obtained if the lateral

end of the incision is curved upward a short distance along the anterior border of the trapezius. The descending branches of the third and fourth cervical nerves which cross the incision should be carefully preserved. The deep dissection should be extensive enough to permit a thorough examination of the brachial plexus with its accompanying blood vessels to the point where they cross over the rib in the subclavian groove. If the abnormal first rib is so rudimentary that it is hidden behind the middle scalene and can cause no mechanical irritation of the blood vessels and nerves the procedure may be limited to division of the lower end of the anterior scalene muscle above its anomalous insertion into the second rib. Such a rudimentary first thoracic rib will rarely be found. In the more common deformities where the first rib articulates with or fuses with the second at the scalene tubercle or continues forward as a prominent bony or ligamentous structure the anterior scalene must be divided and the abnormal rib excised from a point beneath the clavicle back to its disappearance in the posterior muscles of the neck central to the insertion of the scalenus medius. Every effort must be made to leave no bony spur projecting from the superior surface of the second rib as this is nearly certain to be a source of continued nerve irritation (Cases 3 and 4). A residual posterior stump over a centimeter in length is also likely to result in further trouble. This resection is more difficult than removing a cervical rib for the reason that the first rib is so much more deeply situated. It is therefore important that these operations should be carried out under intratracheal anesthesia and that care be taken to avoid perforation of the pleura injury to anomalous blood vessels or the thoracic duct (Harnes) or undue retraction of the brachial plexus. When the supraclavicular operation has been properly performed there should be no need for a second stage posterior removal of the central stump of the rib. This was necessary in our first patient because we had misjudged the need for resection of the deformed rib when the anterior scalene was cut. In Cases 3 and 4 the amount of rib resected at other hospital was totally

inadequate. We feel that after a previous incomplete removal of the upper rib from in front its remaining central stump can best be exposed and removed from behind through the incision described by White, Smithwick, Allen and Mixer (4). Wherever the cause of mechanical irritation has been radically removed the results have been satisfactory.

SUMMARY

Although congenital anomalies of the first thoracic rib are not extremely rare their clinical manifestations are less well known than those produced by cervical ribs.

2 First rib malformations generally consist of a rudimentary structure terminating in a synostosis or pseudarthrosis with the second rib near the calene tubercle or in a free end in the soft tissues at the base of the neck which may be connected by a ligamentous band with the manubrium sterni. On very rare occasions the first rib may have a distinct joint near its lateral angle before it fuses with the second.

3 Other skeletal abnormalities are frequently present which cause further distortion of the thoracic outlet. They consist of deformities of the second rib, the upper end of the sternum, scoliosis of the cervicothoracic spine and vertebral anomalies.

4. Congenital malformations of first thoracic ribs as is true to a lesser extent of cervical ribs are best explained by errors of bodily segmentation in early embryonic development. These are brought about by abnormal formation of the brachial plexus and blood vessels which make their appearance before the bony skeleton. Examples of posterior fixation of the brachial plexus and abnormalities in the arrangement of the arteries at the thoracic outlet were encountered in 2 of our cases.

3. Symptoms and clinical ex le cta of abnormal first ribs consist of (1)praclavicular bony prominence irritation or paralysis of the brachial plexus and compression of the subclavian vessel as they cross the defective rib

6 Cervical arthritis early carcinoma of the thoracic apex and herniation of the lower cervical intervertebral discs must be considered in the differential diagnosis of hirs

chial neuralgia even in the presence of an anomalous rib. Malformations of the first thoracic cannot be differentiated clinically from cervical ribs. They can be accurately diagnosed in an anteroposterior x-ray picture which includes all the cervical and uppermost thoracic vertebrae provided the film is taken with a long exposure and the mandible in motion. Under these circumstances the outline of the mandible will be blurred and the vertebra to which the uppermost rib is attached can be identified by counting downward from the base of the skull. Careful scrutiny should also be made to detect associated abnormalities of the second ribs and deformities of any of the other bony structures of the thoracic arch.

A considerable proportion of first rib deformities are large enough to cause direct mechanical compression of the nerves and vessel at the thoracic outlet. When symptoms are attributable to this condition conservative orthopedic measures should be tried before surgical intervention. Scalero-tomy alone rarely suffices to decompress these structures but must usually be accompanied by radical resection of the rib from a point close to its articulation with the transverse process forward to its attachment to the second rib or where it disappears beneath the clavicle. In cases in which an incomplete resection has been performed through the anterior supraclavicular approach the central end of the rib may still cause irritation of the plexus. Resection of such a stump is then best accomplished through the posterior approach.

8 Our series of malformations of the first thoracic rib now comprises 10 cases. Five of these which required surgical intervention for relief of symptoms are described in detail. We have also reproduced the films from 3 of 5 other asymptomatic cases discovered in the course of radiological examination for other conditions.

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Fig 1. Oscillogram of square wave pulse. 5 millimicroseconds.

pective of the time interval between stimuli. With this apparatus we are able to obtain an impulse of rectangular wave shape lasting for as short an interval as 30 microseconds or as long as desired (Fig 1). Thirty three different time intervals selected to conform to a logarithmic scale were made available. They ranged from period as long as 2 seconds to one as short as 30 microseconds. The duration of the impulse when measurement of galvanic tetanus was desired was 2 seconds.

The material consisted of 5 cats in which section and immediate suture of the sciatic nerve were performed and 6 animals in which after a long segment of the sciatic nerve was removed the proximal stump was injected with alcohol to discourage regeneration. In addition many other animals used for other experiments were examined by this method.

The rheobase was determined by finding the threshold value of current when the impulse lasted one second. Then threshold value of current for the production of tetanus were found when an impulse lasting two seconds was used. By shunting the specimen out of the circuit it was possible to observe the ampere in a suitable milliammeter. As much time as was necessary was used and painful unbearable stimuli and severe polarization changes were avoided.

To obtain comparable results it is necessary to examine each muscle by stimulation with an impulse of the same duration. The character

of the impulse lasting 2 seconds was made because during denervation the contraction of the muscle is slow and impulses of shorter duration produce contraction the plateau of which lasts too short a time for accurate visual observation. The criterion of tetanus was a plateau representing continued contraction throughout the time of the impulse with very little relaxation—in other words a tetanus for the duration of the impulse.

RESULTS

In the examination for galvanic tetanus one obtains two sets of data. The first: the rheobase or threshold current for instantaneous stimulus of infinite duration using both anodal and cathodal closing stimuli. Second: the threshold ampere at which tetanus is produced and sustained for the duration of the stimulating impulse both for anodal and cathodal stimuli. From these procedures one obtains the tetanus ratio by dividing the rheobase current into the threshold current for tetanus. The data obtained may be interpreted from standpoint of changes in rheobase in threshold current for tetanus and tetanus ratio.

THE RHEOBASE

The liminal current necessary for effective cathodal closing stimulus in the normal muscle of the cat ranges from 0.45 to 1 milliampere.

A small initial rise in rheobase occurred at varying days usually from 6 to 14 after section and suture of a nerve and continued for a short time usually a few days. After 2 weeks or little more the threshold for stimulus diminished and the muscle appeared hyperirritable to direct current stimuli of infinite duration. After the third week the median value of liminal current necessary for effective stimulus of gastrocnemius or tibialis anticus is well below the normal rheobase value and is close to 0 milliampere. Although below the normal rheobase value unipolar stimulation required more ampere for adequate stimulus. Thus regardless of polarity the liminal current necessary to stimulate muscle after the third week is significantly less than the normal rheobase.

Following this initial period the muscle becomes completely denervated. Throughout

this time the liminal current necessary for adequate stimulus is very small for bipolar stimulation it may be as low as 0.1 milliamperes and for unipolar stimulation as low as 0.3 milliamperes. When after section regeneration was encouraged by injecting the severed ends of a nerve with absolute alcohol this hyperirritable state continued for 346 days and the rheobase was 0.2 milliamperes for cathodal and also 0.2 milliamperes for anodal closing stimulus. Thus it may be said that the ratio between the threshold milliamperage for anodal and cathodal closing stimulus is at unity.

Forty or 50 days after primary suture there is a gradual more often a sudden increase in the effective current and after the 6th day the current may have doubled or trebled its previous value. Unipolar stimulation accentuates this change. Between the 40th and 50th day the average liminal median current in another series of animals was 1.8 milliamperes at the 50th to 60th day it suddenly rose to 4 milliamperes. After this day in many instances contraction did not occur even at 5 milliamperes. Higher values of current result in so much spread to adjacent muscles as to make the examination equivocal.

Soon after or at a time coincident with the sudden increase of liminal amperage clinical signs of recovery may be found. The liminal amperage remains high long after recovery of motion and sensation. It begins to diminish significantly at 10 days but still remains higher than normal rheobase after 240 days.

We have confirmed in man the changes here described in the cat. The normal rheobase in man varies as to the muscle examined for flexor sublimis digitorum it is about 1.2 milliamperes for the tibialis anticus 6 milliamperes.

During a state of denervation the order of liminal amperage is about one half of the normal rheobase. As neurotization occurs and recovery progresses the necessary amperage may rise from 11 to 40 milliamperes or more (Fig. 2).

CHANGES IN THRESHOLD AMPERAGE AND IN TETANUS RATIO

During the early part of regeneration after severe injury to a nerve and during a long period of time during regeneration after denervation

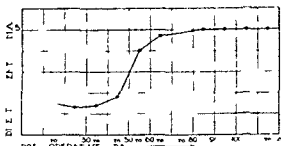


Fig. 3. A graph milliamperes necessary to produce tetanus at various days after suture. The curve shows the change in the threshold amperage for tetanus during regeneration.

changes in the threshold for galvanic tetanus resemble those for denervation. In each there is a rise more marked during the state of regeneration. During the state of denervation the threshold is at its minimum.

After section of a nerve the threshold amperage for galvanic tetanus rises. Then shortly thereafter at 6 days it rises considerably. At a later period after 14 days it rises to a lesser degree. The peak of this rise is found to occur at from the 6th to the 8th day after which it begins to diminish from the 21st to the 35th day until the state of denervation is reached. The average threshold amperage for tetanus at its peak is 3.9 milliamperes for cathodal closing stimulus with a range of from 1.4 to 5 milliamperes—an average of 5.82 milliamperes for anodal closing stimulus with a range of from 3 to 10 milliamperes.

During the state of denervation the threshold amperage is at its lowest reaching this point at an average of 42 days with a range of from 37 to 49 days and the polar ratio approaches unity.

At the peak of regeneration the average threshold amperage is over 14.8 milliamperes for cathodal closing stimulus with a range of from 2 to 7 milliamperes and over 13.7 milliamperes for anodal closing stimulus with a range of from 3.8 to 27 milliamperes.

The threshold amperage begins to rise from its minimal value during the state of denervation at from 4 to 35 days after suture and reaches its peak in from 52 to 60 days (Fig. 3).

THE CHANGES IN TETANUS RATIO

As is the case with threshold amperage and with tetanus ratio the changes during some

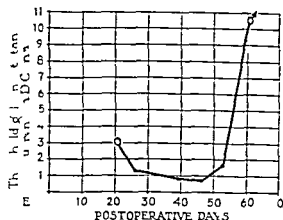


Fig 3 Changes in threshold current in milliamperes of galvanic tetanus during postoperative time

part of degeneration and throughout regeneration are similar and consist of a much greater rise in the ratio during the period of regeneration. During denervation the ratio is at its minimum often at unity both in the case of anodal and cathodal closing stimuli.

Beginning at the same time after suture as rise in threshold and reaching its peak at the same time the average tetanus ratio during the process of degeneration is 8.7 for cathodal closing stimulus with a range of from 3 to 18 and 9.6 for anodal closing stimulus with a range of from 5 to 15.

During denervation the ratio is at its lowest often reaching unity. The average ratio for cathodal closing stimulus is 1.56 with a range of from 1 to 3 and for anodal closing stimulus 1.8 with a range of from 1 to 1.8. There is no doubt in our minds that at some time during denervation unity is reached in every case both for anodal and cathodal closing stimuli. This indeed was true of all animals which were denervated and the unity persisted for over 300 days. After a suture when regeneration is proceeding the exact time at which complete denervation may be present for a few days before neurotization occurs may not coincide with the time an electrical examination is made.

During the regeneration the peak of the average of the tetanus ratio was over 15 in the case of cathodal closing stimuli and over 18 for anodal closing stimuli. Because at the same time the rheobase was elevated it was

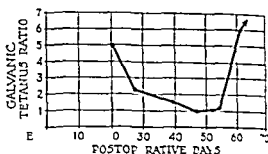


Fig 4 Changes in galvanic tetanus ratio after primary time

often impossible to obtain tetanus with amounts of current which the animal would tolerate without tumultuous struggling. The range of the average of the peak of tetanus ratio was from 3 to over 40 in the case of cathodal closing stimulus and 4 to over 40 in the case of anodal closing stimulus (Fig 4).

During the period of degeneration there is an initial rise in the rheobase threshold ampere for tetanus and tetanus ratio. The rise in rheobase is small that of the threshold ampere for tetanus is usually moderate and there is a large increase in tetanus ratio. These increases are followed by a fall in all until the state of denervation occurs and then the rheobase is at its minimum as is the threshold ampere for tetanus. The tetanus ratio approaches unity and finally if regeneration is not too rapid reaches it both in the case of anodal and cathodal stimuli. With the onset of regeneration there is a larger rise in rheobase in threshold ampere for tetanus and a very large frequently indeterminate rise in tetanus ratio.

The change in threshold ampere for tetanus and of tetanus ratio are the same as the changes of threshold ampere for contraction with progressive currents and of ratio of contraction with progressive currents. In the present experiment we have examined the animal both by progressive currents of long duration and for galvanic tetanus. The changes revealed by these two methods of examination were compared and found to be similar. These results may be quickly visualized in Table I. They may also be seen in a graph showing the changes in response to progressive current contraction and rheobase compared to another graph showing the

TABLE I—RESULTS OF EXAMINATIONS

Stimulus	Progressive current	Threshold	Tetanus
Denervation	Initial approach	Initial threshold	Initial tetanus
Recovery	Minimal approach	Minimal threshold	Minimal tetanus
Regeneration	Initial approach	Initial threshold	Initial tetanus

change in the threshold current for galvanic tetanus and tetanus ratio at varying days after primary suture (Fig. 5).

In a number of peripheral nerve injuries in man we have confirmed the approach to unity of the tetanus ratio during denervation and its marked rise during regeneration. Moreover in these cases the data derived from examination with stimuli by progressive currents of long duration parallel the changes in tetanus and tetanus ratio.

INTERPRETATION

In the interpretation of the data obtained from examination for galvanic tetanus the time which has elapsed from the date of injury or operation is of considerable importance. When sufficient time has elapsed for complete denervation to have occurred and upon examination one finds a high threshold amperage for tetanus, a high tetanus ratio and a high rheobase the nerve is spontaneously recovering.

When a sufficiently long period of time has elapsed after suture for regeneration to have occurred the nerve is not regenerating if the rheobase is minimal, the threshold for galvanic tetanus minimal and the tetanus ratio approaches unity. This conclusion applies for both anodal and cathodal stimuli. The same conclusion may be reached when these data are obtained at a time when regeneration should be expected when a lesion of a nerve is thought to be spontaneously recoverable.

DISCUSSION

We have called attention to the importance of studying galvanic tetanus resulting from the passage of a strong galvanic current through a muscle apart from other changes in

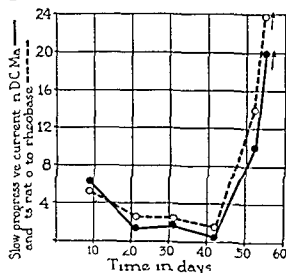
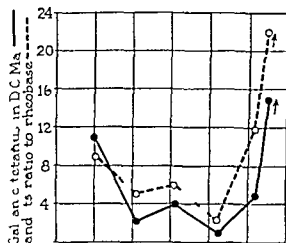


Fig. 5. Change in galvanic tetanus and its ratio to rheobase over time in days after primary suture of the sciatic nerve in the rat.

the character of the contraction of a muscle. Tetanus results when a galvanic current conveying stronger current than that necessary for liminal stimulus is used. It has been variously called myotonic reaction, galvanotony and galvanic tetanization. Since it results from galvanic stimulation we propose it be called galvanic tetanus. As the absolute value of the threshold amperage for tetanus may be quite high when the rheobase is high because of changes in the tissues such as edema etc. it is valuable to estimate the ratio

JUXTACERVICOVESICAL FISTULA

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FORTUNATELY for suffering womanhood the skill of the obstetrician gynecologist and radiologist has increased that the surgery of unusual vesical fistulas has been relegated almost to the limbo of the lost arts through the very lack of opportunity of its practice (except for the occasional gynecologic surgeon who fortuitously has acquired a wide experience in the handling of these cases through being associated with a large clinic and having an especial taste for urological lesions). The exposition of the method of cure of the occasional bizarre case would seem to be justified in order that one so confronted may have the benefit of employing what might be regarded as a procedure which has been standardized at least by the experience of a surgeon who previously has encountered one or more similar unusual anatomical lesions.

Juxtacervicovesical fistula exemplifies such a rare condition among vesicovaginal fistulas that the spectacle of complete urinary evacuation via the cervical canal is apt to be disconcerting at first glance to one not well accustomed to the handling of the problems of urinary incontinence.

The mode of procedure is rather simple—as are other methods of definite proved value in surgery—and the cardinal principle of the mechanics of fistula repair indelibly identified with Marion Sims—the adequate exposure, closure by suture and catheter drainage—are now as in his time—a *sine qua non* in obtaining a cure especially at one stage.

The distinctive feature of the juxtacervicovesical or cervicovesical fistula—the occurrence of fistulous tract from the bladder to the vagina traversing the cervix uterine junction or being immediately adjacent to it (Figs. 1 and 2). A few generalizations may be made concerning the surgical attack upon vesicovaginal fistulas as a whole. The vaginal approach without question befit from every point of view

if adapted to the anatomical situation but in individual cases exposure may be difficult even with a deep Schuchardt incision. Transvaginal approach as advocated by Young has a definite place in the armamentarium of one dealing with these problems and renders relatively easy the successful outcome in cases difficult by the classical vaginal approach and has been employed successfully by the author in a small series of one stage closures of difficult cases and is particularly well adapted after panhysterectomy. (8) The objection of failure of closure of the suprapubic drainage (Couneller 4) and the scepticism of other authorities (Curtis) do not seem to be justified in condemning this method categorically. Suprapubic drainage with the patient in the prone position on a Bradford type of frame if necessary is quite well tolerated by a patient invariably eager for a cure of her ailment. The prone position is advantageous even without suprapubic drainage. In our hands suprapubic cystostomies have closed at once upon cessation of tube drainage and contraction of the bladder was not a noteworthy consequence. It should also be borne in mind that suprapubic drainage and the prone position practically foreordain a successful result with the healing of the fistula at one attempt and should be considered a essential in dubious cases.

The suggestion of Heaney of insertion of a radium needle of 1.5 milligram and giving a maximum of 250 milligram hour into very small fistulous tract is interesting and granted the dosage were correct for the given caliber of the fistula the rationale seems perfect in view of the complete constricting fibrous reaction of radiation.

Balcock in vesicovaginal fistula, in general traces the proximity of the ureter if fistulas are high almost invariably true in cervicovaginal fistulas.

Graves recommended closure by bladder mobilization and in cases of high fistula of using the abdominal route.

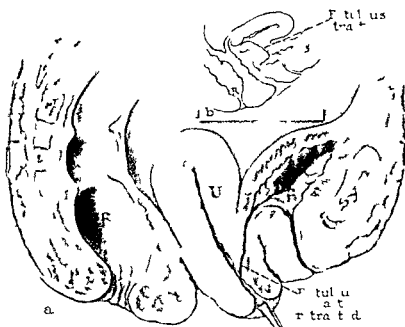


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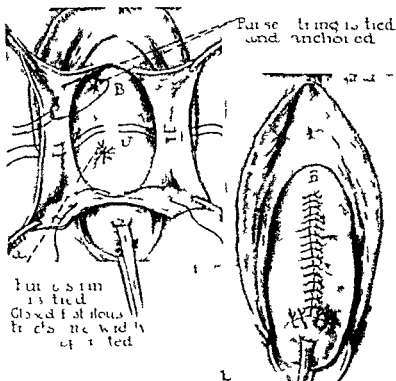


Fig 2 a b. The fistulous tract is closed and the uterus is sutured. The fallopian tube is sutured and anchored.

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chromic catgut ties. A reticulated catheter was placed in the bladder.

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SUMMARY

The successful closure was obtained here by wide and free mobilization of the bladder as a preliminary step—really an open suture to the cure of vesical hernia anywhere permitting as it does suture without tension which almost presupposes and guarantees proper healing displacement of the vesical lesion laterally and cephalad under the pubocervical fascial edge (Fig. 3a) a distance of 3 to 4 centimeters and interpolation of a fascial bulkhead between the two fistulous orifices separately closed.

It seems advisable to emphasize in complicated fistulas the maintenance for 12 days postoperatively of the prone abdominal position of the patient coupled with catheter drainage. Contrary to the expressed opinion of some observers this position is extremely well tolerated by the patient and offers a great increase in the certainty of one stage closures. This position has been advocated by Clute and Young and by this clinic in a previously reported series of 4 transvesical closures of inaccessibile vesicovaginal fistulas all following panhysterectomy and all closed successfully at one operation by the transvesical route.

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INTESTINAL INTUBATION IN BOWEL OBSTRUCTION

Technique with a New Single Lumen Mercury Weighted Tube

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THE history of intestinal intubation and its indications and contraindications in the treatment of bowel obstruction have been so well described (2) that it is not the author's intention in the present communication to dwell at length upon this aspect of the subject. Emphasis is placed rather on methods of intubation, the technique of intubation based upon personal experience with 36 cases of small bowel obstruction in which intubation was used either as the only form of treatment or as preoperative or postoperative therapy.

Wangensteen and Dearing have classified intestinal obstructions into clinical groups showing which are suitable to treatment by (1) *intubation alone*, paralytic or adynamic ileus, e.g., postoperative or occasionally adhesive bands; (2) *perforation and intubation*, adynamic ileus types of mechanical obstruction in early stages; (3) *anastomotic and postoperative intubation*, strangulated obstruction, e.g., mesenteric thrombosis, hernia, volvulus and intussusception.

It is no longer advocated the use of intubation in the treatment of the so-called strangulation type of bowel obstruction. Such cases demand early or immediate surgery and likewise nearly always demand postoperative intubation therapy because of the subsequent paralytic type.

(Ileus or partial obstruction which occurs late in newly formed adhesions). In a future report it is hoped to publish detailed case histories from the present series illustrating the uses of intubation in the treatment of the various types of obstruction.

Millar's use of the siphon method of Miller and Abbott has been described in an attempt to pass the tip of the tube rapidly through the pylorus and into the obstructed small bowel. Thus, W. O. Miller and Abbott recently used a wire tipped intubation tube which was described by Lieutenants Henry Mayer described using a siphon method to pass the tip of the Miller-Abbott tube so that with the use of a magnet applied to the tube again the patient's stomach the tube could be drawn through the pylorus under direct

fluoroscopic observation. H. B. Morton suggested the use of a special tip weighted with lead shots to be added to the Miller-Abbott tube. In this respect he is also using the principle of gravity or a heavier weight in an attempt to carry the tube through the pylorus. I have had no personal experience with any of these methods. They all indicate the difficulty of passing an intestinal tube into the small bowel by previously described method.

In a report published after experience with 19 consecutive cases in which successful intubation was carried out by means of a mercury weighted Miller-Abbott tube the author (5) demonstrated that the use of metallic mercury in this manner facilitated rapid and certain passage of the tube into the small bowel. It was his belief that this method of using mercury as original however it appears that approximately simultaneously Dr. Ivar Sivertsen of Minneapolis had had the same thought but lacked the clinical material to experiment with this system (11). The only other similar use of mercury in this manner as described by Wilkins in 1908, he used a small amount as a weight in the bucket of a single lumen nasal tube.

Since publication of the preliminary report on the use of mercury in the lumen of the Miller-Abbott tube many personal communications have been received from surgeons throughout the world describing enthusiastically their success with this simplified technique of intestinal intubation. With this added confirmation of the successful use of mercury in this manner further clinical studies on the use of a single lumen mercury weighted tube have been carried out as rapidly as material presented itself.

The principle upon which a single lumen mercury weighted intestinal tube is indicated is that a weighted tube, carrying the tube into the small bowel by force of gravity in contrast to the principle of peristaltic activity, gains the intubation of the Miller-Abbott tube. The insertion of the mercury moiety into the outline of the nasogastric intubation tube results in minimum discomfort and trauma arising from its passage.

There are certain dangers and disadvantages to the use of a single lumen tube as well as to the double lumen. The author had a personal experience with

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Presented at the meeting of the American Association of Surgeons, Chicago, Ill., 1934.
Read before the American Association of Surgeons, Chicago, Ill., 1934.

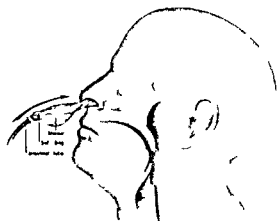


Fig. 1. The tube is inserted into the nose. Fig. 2. The tube is inserted into the nose.

other 12 centimeters distal to the first. A thin rubber bag or c n l o m 12 centimeters long is used to hold the mercury in place on the tube (Fig. 1). A hole is made in the closed end of the bag which is then inverted slipped over the tip of the tube for a distance of about 2 centimeters and securely tied with No. 1 thick silk thread. The bag is then pulled back over its free end and 4 to 6 cubic centimeters of metallic mercury are placed in it and its free end is securely tied to the tube. By fastening each end directly over its corresponding metal sleeve the tube is prevented from collapsing due to pressure of the intubations.

The tube is then adapted to use in infant by employing a No. 12 F tube, about 5 to 6 feet long. The first mark should be at the length of the tube with the 6 centimeters of the amount of mercury to 3 cubic centimeters. As with the adult experience with the tube.

TECHNIQUE OF INTUBATION

Preparation of the tube. It is important that the tube be left in the closed position before it is secured to the patient with its contained mercury. The tube is then inserted into the nose and the tube is pulled back over its free end and 4 to 6 cubic centimeters of metallic mercury are placed in it and its free end is securely tied to the tube. By fastening each end directly over its corresponding metal sleeve the tube is prevented from collapsing due to pressure of the intubations.

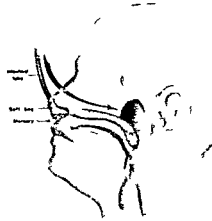


Fig. 3. The tube is inserted into the nose. Fig. 4. The tube is inserted into the nose.

the tube is elevated (Fig. 3) to permit the mercury automatically to flow into the distal part of the bag which is in the passage of the tube into the nasopharynx (Fig. 4) and to prevent the stomach.

After the tube has passed into the stomach and has been attached to a Wangersteen type of suction apparatus so that the stomach is completely emptied its contents the patient is propped up on his right side in the emboiler, sitting in the exact manner described in the original technique of intubation by Miller and Abbott. If he is not too sick, careful of the advantages to have him in a supine position and even alkali for

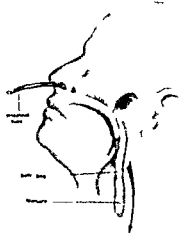


Fig. 5. The tube is inserted into the nose. Fig. 6. The tube is inserted into the nose.

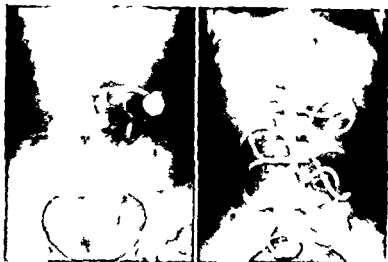


Fig. 5. Case No. 86. This young lady was brought to the hospital with diagnosis of intestinal obstruction. The tube was inserted into the mouth and secured to the cheek. The tube was then inserted into the stomach and the patient was able to take food. The tube was removed after 48 hours and the patient was discharged.

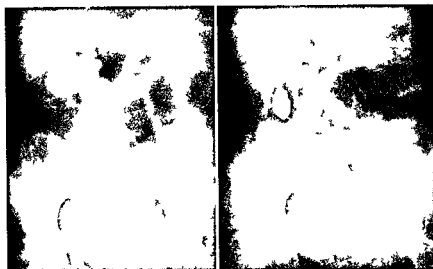
from 5 to 10 minutes or longer. The upright position and physical activity aid considerably in provoking a more rapid descent of the tube into the duodenum and jejunum.

A minor point of technique which must be emphasized again is that of ascertaining that progress of the tube is not restricted by the adhesive tape attached to the cheek. A liberal loop of slack tubing, usually 6 to 12 inches, should be left alongside the naris so that the spontaneous descent may be observed and measured carefully by the nurse. The nurse is requested to note on the tubing the inch mark which shows at the external naris immediately after the tubing has reached the stomach. She is then told not to allow the tube to move spontaneously or to be helped along at a rate greater than 1 inch every 10 minutes. If the tube appears to be moving too fast this rate is decreased to one inch every 15 or 20 minutes. There is a tendency on the part of the nursing personnel and the house staff to try to hurry the descent of the tube by feeding it into the nasopharynx at too rapid a rate. This inevitably will result in coiling of loop of the tubing in the stomach preventing the ultimate passage of the weighted bag into the small bowel. In most cases with a little patience it will be found that the tube tends to descend by itself.

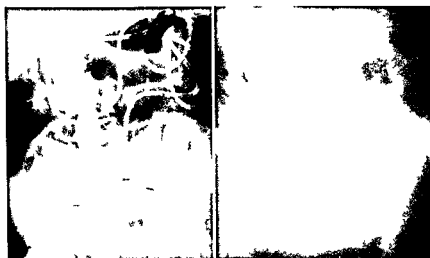
The advantages of calibration obviously are that we are able to obtain exact nursing information

concerning the length of tubing which has descended in a given interval. There is considerable variation in the rate of progress. In one patient the tube moved so fast that four feet appeared to be taken into the intestine in less than 8 hours. In other cases there was a tendency for some of the tubing to coil in the stomach itself although the mercury weighted tip had definitely passed into the small bowel. In still another group after fairly rapid passage of approximately 2 feet and with evidence from the drainage that the obstructed intestine was being decompressed the tube appeared to stop in its progress for perhaps 4 hours at a time. However further progress in such a case seems unnecessary as the purpose of the decompression has been accomplished. It has also been noted that when this tube is used in a nonobstructed case such as in preparation for large bowel ulcer surgery it descends so rapidly that a considerable length (8 to 10 feet) may be drawn into the intestine with no further such occurrence can be averted by stopping the passage of the tube at the 4 or 5 foot mark until subsequent flat film shows the exact location of the tip.

A further point of progress is that the tube is comfortable or uncomfortable in the mouth. The tube must be carefully checked to be flat or so called scintilla films of the abdominal taken at frequent intervals. During the first 48 hours it is an absolute test of the structure



b



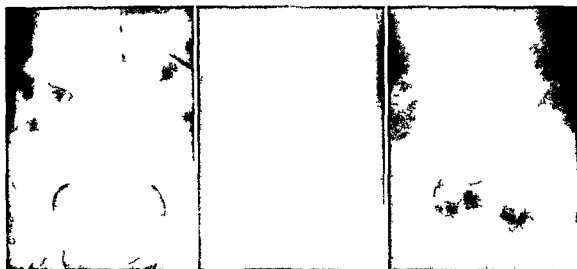
d

Fig 6 Case No. 74. Films showing the progression of the obstruction. (a) Initial film showing a large, rounded mass in the upper abdomen. (b) Film showing the mass becoming more defined. (c) Film showing a complex, tangled mass. (d) Film showing a more diffuse, cloud-like mass.

been treated by intubation at last the films will have been taken approximately 12 to 15 hours apart. If these films show favorable progress of the tube with deflation of the distended intestinal loops the patient may continue to be treated conservatively by intubation alone (Case 1, Fig 5 a, b). If clinically and radiologically the patient is not doing well or if the tube has not made satis-

factory progress the surgeon has not lost too much time in determining that operation is essential (Case 2, Fig 6 a, b, c, d). In either type of case the intestinal tube is not withdrawn until follow-up abdominal films show complete disappearance of any evidence of obstruction.

In treatment by intubation alone of the simple type of intestinal obstruction the tube usually re-



DEFORMATION OF THE SKULL IN HEAD INJURY

A Study with the Stresscoat Technique

F S GURDJIAN MD FACS J H R IISSNER BS MS D t t Mich g n

In a previous communication (3) deformations of the skull of the dog under anesthesia at the time of a blow studied with the aid of the cathode ray oscilloscope were discussed. In this paper we wish to report results obtained by the use of the stresscoat technique (1, 2) to indicate deformations of the skull resulting from hammer blows. If deformations are of sufficient magnitude they cause cracks in a strain sensitive little coating previously applied to the surface of the skull. By this method the resultant deformation patterns in the immediate vicinity of as well as remote from the blow may be studied.

TECHNIQUE

Dogs and monkeys were used in order to establish a correlation between the results obtained in the dry skull, the skull of the dead animal with the intracranial contents undisturbed and the skull of the living animal under nembuthal anesthesia. Further studies were made on human material consisting of dry skulls and skulls of cadavers from the anatomical laboratories of the University.

In each of 6 dogs the skull was posed after the temporal muscles were dissected away from the bone down to the region of the zygomatic arch. The temporal muscles were then carefully sutured to the upper jaw to keep them out of the way and to minimize the possibility of moisture and soiling in the area under study. The surface of the skull was cleansed by scraping the muscular and fascial attachments and smoothed by sandpapering. It was then sealed with ether. The preparation was then ready for stress coating. The experiment the details of which are given below was completed in about 10 hours. Two to three additional injections of nembuthal were needed to keep the animal under anesthesia. At the conclusion of the experiment the animal was killed and the same procedure was carried out on the skull to show the pattern of deformation was essentially the same as the living animal. Later the contents were removed and the skull was cleaned. An ether gas preparation

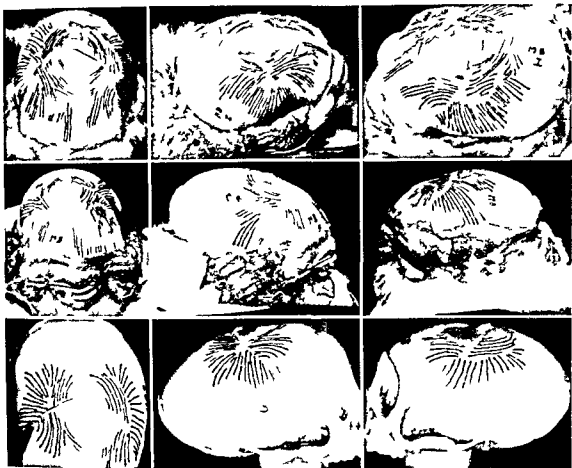
were then carried out on the dry skull to note correlations of pattern. In one macaque monkey a coronal incision was made from ear to ear. The scalp, the small masseter muscles and the deep muscles of the neck reflected so that the skull was exposed from the level of the orbital rim anteriorly to the foramen magnum posteriorly and from zygomatic arch to zygomatic arch laterally. The skin and muscles were sutured to the upper jaw anteriorly to the cheeks laterally and to the neck posteriorly. The strain patterns were studied in the monkey under anesthesia on the skull of the dead animal with contents intact and later on its dry skull. In another monkey (macaque) the strain patterns were studied on the skull of the dead animal with contents intact and later on the dry skull.

Stresscoat is the trade name of a brittle lacquer method of strain determination in any structure subjected to static or dynamic forces. The surface of the structure is coated with a lacquer. Cracks form in this coating when the material to



A photograph of the skull of a dead monkey with stresscoat applied. The skull is shown in profile, with the stresscoat covering the surface. The coating has cracked, revealing a pattern of strain. The cracks are visible as dark lines against the lighter background of the coating. The skull is positioned in the center of the frame, with the stresscoat covering the entire visible surface. The background is dark, making the skull and the stresscoat stand out.

From the Department of Surgery, University of Michigan Medical School, Ann Arbor, Michigan. Received for publication, July 1, 1964.



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taped to the body to insure similar temperature conditions

Blows were struck with the flat portion of an 8 ounce ballpeen hammer. The stresscoated resins as then covered with a red dye etchant solution which penetrated all the cracks formed by the blows. When the etchant was removed by an emulsifier solution the red dye remained in the cracks. The dye etchant treatment is necessary because the cracks frequently close so tightly after the blows that they are not visible. In the final emulsion the etchant was removed 40 seconds after its application. In the dry skull it was allowed to remain on the liquor for about 90 seconds before it was moved with the emulsifier. In the tests on living animals the dye etchant and emulsifier

was heated slightly above body temperature before application. The emulsifier was washed away with warm tap water in the case of dry skulls and with water heated to slightly above body temperature in the case of tests on animals under anesthesia. The skull was then allowed to dry.

The pattern is best visualized with the aid of a magnifying glass and with proper adjustment of the direction of the light which illuminates it. A permanent record of the cracks are traced with India ink and the skull is then photographed. An unretouched preparation is shown in Figure 1. It must be noted that most unretouched preparations would not photograph well because of the faintness of the cracks.



Fig. 5. Strain patterns following a blow to the middle of the frontal bone. The blow was applied to the middle of the frontal bone, and a blow in the lateral posterior parietal region was studied.



strain patterns caused by a given amount of absorbed energy. The effects of a midoccipital blow near the parieto-occipital suture, a midfrontal blow, a midline vertex blow, a blow in the lateral frontal region, and a blow in the lateral posterior parietal region were studied.

Midfrontal blow. A midfrontal blow was studied on 1 cadaver and 2 dry skulls. A midfrontal blow if sufficiently light may cause only a local deformation at the point of impact. If a strong blow is used, strain patterns appear at the supraorbital ridges and extend down into the roof of the orbit (Fig. 4). Other patterns are noted to course obliquely downward and outward along the lateral aspect of the frontal bone to the pterion. Some extend well into the temporal bone (Fig. 5). A blow applied in the midfrontal region to the left of the midline caused extensive strain patterns as well as a fracture from the border

of the area of impact to the left supraorbital notch. It should be noted that this line of fracture is at right angles to the strain patterns seen on the surface of the skull due to the fact that it was initiated on the internal surface of the skull. Its extension toward the supraorbital notch is explained on the basis that such a notch or foramen represents an area of stress concentration. Simultaneously with strain patterns on the outside of the skull there are patterns on the inner surface of the skull, and these internal and external patterns meet at right angles to each other. In this structure one also notes the presence of patterns crossing each other. These are produced by the successive deformations of the skull following the blow before the structure comes to rest again.

Midoccipital blow. A midoccipital blow was studied on 1 cadaver and 2 dry skulls. A blow in the midoccipital region near the lambdoid suture causes



FIG. 6. St a patt rn h man cada prep-
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S h d f r t u m es lt tra l pres-
re es j r y t bra t m d m
d ll



b



marked deformations of the skull about the frontal bone. The central portion of the occipital bone. The concentration of stress seen in the dry skull as well as in the t of the cada-er Sche ten ed f r m a t i o n s b o t t h e f r a m e n m a n u m m a s e t p n t r a n l p r e s u e a v e s w h i c h m a c a u s e i n d e m e n t f t a l t r u c t u r e s i n t h e m e d l l a a n d b r a i n s t e m . T h m a i n p a r t e x p l a i n w h b l o w s p o n t h p o s t e r i o r

aspect of the skull is more dangerous than those the anterior portions. With later blows similar but less extensive patterns are obtained. In Figure 6 b and c a fracture line extended from the border of the area of the blow to the lower d d suture was most probably initiated at the suture and extended far the border of the area of impact. So many other radially arranged lines of crack in the stresscoat which appeared to

capital blow near the lambdoid suture there were evidences of extensive deformation about the foramen magnum. These strain lines parallel the three types of fracture frequently seen in this region. These are first fracture lines extending from the occipitoparietal region into the lateral aspect of the foramen magnum; second, those extending toward the base just lateral to the foramen; and third, those which end in one of the lateral foramina such as the jugular foramen or may extend further forward toward the petrous bone. Lateral frontal and lateral posterior parietal blows on the skull caused cracks in the lacquer extending to and the temple with the former the direction of the cracks was downward and posteriorly and with the latter downward and anteriorly. The direction of the cracks parallels most fractures in this frontosphenoidotemporal and parietotemporosphenoidal neighborhood.

Although human and lower forms differ in their strain patterns the use of the lower forms to note correlation of results in the animal under anesthesia and in the dry skull is of inestimable value. Strain patterns obtained from live and dead animals and from dried skulls were sufficiently similar to state definitely that the hydrodynamic effect of the contents of the skull in the live or dead animal did not materially change the pattern as obtained from a study of the dry skulls. This does not imply that the magnitude of the strains is the same but that the strain paths are the same. From the foregoing facts it can also be justifiably deduced that the effect of the skin and muscles on the strain pattern is negligible.

A study of the skulls in which a fracture was obtained reveals that this was brought about by tensile strains either on the internal or external surface of the skull. Failure may start on the internal surface of the skull due to the internal bending or it may begin on the external surface as the secondary deformation causes an uplifting of the skull.

Patterns obtained in some preparations clearly indicated that following a blow the skull is raised before coming to equilibrium at rest. This was shown by the presence of several strain patterns superimposed over one another. From a study of the interrupted or discontinuous lines the order of formation of the pattern can be determined. (Fig. 1) With the muhammirensis the path of the

ray oscilloscope-strain gauge method several in bending and outbending movements were noted following a single blow (3).

In the present paper only the effects of general deformation of the skull caused by blows administered with the flat surface of a ballpeen hammer are discussed. Bullet and other penetrating wounds and blows by the relatively sharp border of blunt objects are not considered. It is agreed that the strain patterns may be given a certain directional character depending upon the area of impact and the velocity of the injuring object. However, it is felt that in head injury a society with general deformation of the skull fractures occur in regions proved to be areas of stress concentration as shown in these studies.

CONCLUSIONS

1. The stresscoat method is admirably suited for the study of deformations of the skull in head injury at the point of impact and in remote regions as well.

2. The results of these experiments indicate that dry bone is less having different strength and stiffness characteristics than living bone may be used for the determination of paths of strain under dynamic impact and areas of weakness may thus be determined.

3. Deformations of the skull may be more extensive at some distance from the point of the blow than they are in the region of the blow.

4. Deformations at the base of the skull due to a blow on the occiput are of an order of magnitude great enough to set up waves of pressure in the region of the brain stem and medulla.

5. When fracture of the bone occurs the failure is due to tensile stress. Failure may start either on the external or the internal surface of the skull.

6. Strain propagation characteristics are dependent upon the shape and variations in thickness of the skull hence some variation may be expected in the strain patterns in different skulls.

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AMPUTATIONS DURING THE WAR AND AFTER

PAUL F. OLSON, M.D., F.A.C.S., Lieutenant Colonel, MC, U.S.A.R.

MUCH has been added to our knowledge of amputations during the war. Surgical experience has been large and concentrated and more important the surgeon has worked together with the maker of artificial limbs so that prostheses can be more skillfully fitted to amputation stumps and results more efficiently evaluated.

In the past progress in the shaping of amputation stumps has been retarded because the surgeon and the limb maker have not been closely associated. Surgeons perpetuated the practices of their predecessors with little knowledge of what constitutes a stump suitable for a prosthesis. On the other hand limb makers recommended a suitable stump but they did not know how it could be fashioned surgically. The war has overcome this difficulty much to the benefit of the patient by bringing together in amputation centers both the surgeon and the limb maker.

AMPUTATIONS IN THE MILITARY SERVICE

In military service amputations are performed in the most part on traumatized and often in infected extremities. It is therefore usually advisable to divide the operation into two stages: a preliminary open amputation is done in the field and after the patient has been evacuated to an amputation center the stump surgically prepared for the application of a prosthetic appliance.

Preliminary amputation. The preliminary open amputation is a modification of the old guillotine amputation with important alterations.

First it should be pointed out that a preliminary open amputation is never by choice carried out through the site of election for the finished amputation. The classical sites of election for flap amputations are well known but the fact cannot be emphasized too strongly that such sites do not apply to open amputation. The object of an open amputation is to remove all of the devitalized tissue and to preserve all of the valuable tissue. The site of election is the effective site of demarcation in other words the highest the most distal point of viable tissue.

The preliminary open amputation is a life saving procedure. The use of which is irreplaceable.

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and is removed and the stump left open so that no infection will be enclosed. The general health of the patient usually improves rapidly and sufficient viable tissue remains a good stump can subsequently be fashioned by a plastic revision.

The preliminary open amputation differs from the old guillotine amputation mainly in the manner in which the skin is dealt with. The healing of the stump can be greatly hastened and the quality of the final result much improved by preserving sufficient skin subsequently to cover the end of the stump. This is accomplished by incising in the skin distal to the point at which the bone is to be severed at a distance equal to one-half of the diameter of the stump. Obviously the diameter of this is considerably greater than that of a wrist but if the cuff of skin is equal to one-half of the diameter of the stump it will suffice eventually to cover the end of that stump. The skin is dissected back and the muscle and bone are severed. From here the procedure may vary. If the contamination is minimal the skin may be provisionally drawn together over the end of the stump by a suture in the midline, the corners being left well open for drainage. If there is infection the stump is left open and the edges are drawn down to contract on. Either way the healing of the stump is greatly expedited and at the same time all the advantages of an open amputation are preserved.

Second stage. When the stump has healed following an open amputation a distal limb field has been obtained. Simple plastic procedures often suffice to prepare the stump for a prosthesis. The scar is excised and the lateral prominences are eliminated. Should the available skin be insufficient to permit of approximation it will be necessary to shorten the stump, however undesirable that may be, in cases in which the stump is already too short. If the length of the stump is sufficient for a reamputation at the site of election a flap is laid out and a pedicle is carried out identical with the primary flap amputation which will be discussed. Let it later. However, emphasized the end of the stump must ultimately be covered by skin and in the case of a suture or graft.

Ida's leg. f k t ct. Skin el t ti ue and will retract after it is incised. If the skin margins are allowed to become fixed by a scar tissue in the retracted position it will re-

quire months for the end of the stump to epithelialize and then it will be necessary to shorten the stump in order to accomplish a satisfactory closure. For expedite healing and to obtain a good result it is necessary to apply skin traction at the completion of an open amputation and to continue the traction until the stump has healed.

PRIMARY FLAP AMPUTATIONS

Whether the amputation is performed in one stage or in two the final result to be desired is the same and will be discussed at some length together with the technique employed.

Amputations through the foot and ankle. In the foot an amputation through the tarsometatarsal articulations is acceptable although it deprives the patient of the spring in his gait. It is desirable to preserve a long flap of the plantar skin to cover the end of the stump. Of course an amputation more distal is preferable.

Amputations which preserve only the astragalus and the os calcis have important disadvantages. The insertions of the dorsiflexors are lost and the action of the Achilles tendon is unopposed. As a result the function of the ankle is decreased. Also it is difficult to fit such an amputation with a serviceable prosthesis.

The Syme amputation is probably the best in this area. The tibia and fibula are severed just proximal to the ankle joint and the heavy skin of the heel is used as the covering so that an end-bearing stump is obtained. The prosthetic appliance is functionally satisfactory and provides good ankle motion. However it is bulky and a lady who desires a trim ankle would want no part of it.

Amputations below the knee. The best results in this war have been obtained with below the knee amputations. The employment of a debarring prosthesis permits the patients to bear weight on their stumps for long periods of time. The mechanical ankle joint closely reproduces the original and plastic materials permit the limb to be light yet strong. If the patient has lost only one leg he may walk with a limp that is all but undetectable. Patients with both legs off below the knee walk and even do the intricate modern dance surprisingly well.

There are two mechanical factors to be considered in every amputation stump: the lever and the muscles which motivate that lever. Below the knee the stump is controlled by the quadriceps and hamstring muscles which insert into the proximal end of the tibia. Beyond that section the stump serves only as a lever and the muscles which are severed at the amputation are no longer functional. Consequently there is no ad-

vantage in a long stump. In fact a long stump will have a poor blood supply at the end which may give trouble later. Also a long stump does not lend itself well to the fitting of a prosthesis. The functional length of the stump is in reality measured from the hamstrings but practically the length of the stump is measured in terms of tibial length. About 6½ inches of tibial length is optimum. Too short a stump will tend to disarrange from the bucket of the prosthesis and will restrict the usefulness of the knee.

In performing the amputation the anterior flap is laid out longer than the posterior in order to bring the suture line posterior to the end of the tibia. In the dissection back of the posterior flap the fascia is included with the skin. It is not desirable to include the fascia in the anterior flap as it blends with the periosteum. The tibia and fibula are sawed through at the designated point. The fibula is subsequently shortened an additional 1 inch by means of an amputation knife the muscles are severed at the same length as the tibia and are beveled somewhat posteriorly. The large vessels are secured and the tourniquet is removed. The nerves are drawn down gently severed and allowed to retract into the soft tissues. The end of a nerve must not be permitted to become adherent in scar tissue as a painful stump may result. The crest of the tibia is beveled to give a well rounded stump. The subcutaneous tissues are approximated with a few interrupted sutures before the skin is closed.

Should the stump be opened after the patient has walked for some time the bone will be found to be covered by a glistening smooth white fibrous tissue over which the skin moves freely. It is important that the suture line lie posteriorly to the end of the tibia so that it does not become adherent to the bone. Laterally the incisions should not be carried too high otherwise the blood supply to the central portion of the flaps may be jeopardized. In the event of the muscle it must be remembered that it will retract a little and unless allowance is made the end of the bone will be exposed. The objective is a rounded not a conical stump. The bone should be clothed by muscle laterally but not over the end.

The fibula will ordinarily assume a position posterior as well as lateral to the tibia. It lends resilience to the stump and should be preserved unless it is very short and is abducted so that it punches into the skin on weight bearing. In those infrequent cases in which the fibula is removed it is necessary to smooth off the shelf of the tibia from which it was articulated in order to avoid a pressure point for a debarring prosthesis.

series of jerks and tend to spread to the remainder of the musculature on the side contralateral to the injection. Between the attacks the animal appears ill at ease. It may attempt to prevent the twitching by grasping the involved member with the contralateral forelimb. The clinical unilateral attacks may last from a few seconds to a few minutes gradually or suddenly decreasing and stopping. Frequently after several such attacks the fit extends to the opposite side of the body and all four extremities become involved in the clonic seizure. During the convulsion the animal may continue to grasp the bars of the cage and may resist any attempt to catch it. However both during and after the fit the animal appears fixed and confused. These general clonic attacks may last from a half minute to 6 or 8 minutes. With the latter attack consciousness is lost and for 1 to 2 minutes after the fit the animal is unconscious. As consciousness returns the myoclonic twitches begin again in the extremities contralateral to the site of injection but rapidly predominate to the entire body. Such serial convulsive attacks may last for over 7 hours.

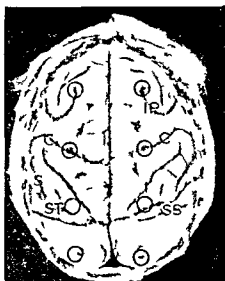
Rarely a few minutes after the intracortical injection of penicillin a monkey will have a tonic clonic convulsive seizure without a focal beginning. Such attacks have been observed only on 2 or 3 occasions in series of over 100 experiments. On no occasion such a generalized seizure was observed 2 hours after the injection without premonitory signs.

For the purpose of this clinical investigation we classified the attacks as unilateral or local, tonic or clonic, or major convulsions depending upon the extent of involvement of the musculature. We do not imply in so far as the convulsive action of the penicillin is concerned that the unilateral fit is any less important than the general fit.

CONVULSIVE THRESHOLD FOR PENICILLIN IN THE MONKEY

In a previous paper we have reported the convulsive threshold for the first group of monkeys in this series (6). As further confirmation of the previous studies an additional series further studied the convulsive threshold values determined in the second group of 10 monkeys. Commercial penicillin dissolved in normal saline was injected into the second right anterior burr holes (electroencephalogram cortex) with varying concentrations of the drug.

Because the first group of monkeys had been treated with large doses first the order was reversed in the second series of experiment. Into the right motor cortex of each animal 0.05 cubic



centimeter of normal saline containing 250 Oxford units of commercial penicillin was injected. Only one monkey had a unilateral fit. Two days later each of the group was injected with 500 Oxford units in 0.05 cubic centimeter of normal saline. One monkey had a generalized fit and 5 had unilateral seizures. On the next occasion each animal was injected with 1,000 Oxford units dissolved in 0.05 cubic centimeter of normal saline. Four of the 10 monkeys developed major attacks and 5 had unilateral fits. When the group was injected with 2,000 Oxford units of penicillin in 0.05 cubic centimeter of normal saline 3 animals developed generalized convulsions and 7 displayed unilateral fits.

The convulsive threshold was similarly determined for pure crystalline penicillin. The injections were made in the premotor and motor cortex on the left side. The series of injections of 0.05 and 250 Oxford units were made into area 8 and those of 1,000 and 500 Oxford units into the motor cortex. The results are shown graphically in the last 2 figures (Fig. 2). It is apparent that the convulsive threshold for pure crystalline penicillin is practically the same as that for the commercial penicillin. It is of value then that the convulsive factor is associated with the penicillin and not due to a contaminant or impurity.

PENICILLIN CONVULSIONS

The Convulsive Effects of Penicillin Applied to the Cerebral Cortex of Monkey and Man

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JERRY J. KOLLROS Ph.D. Ch. C. Z. III OIS

ALTHOUGH parenteral administration of penicillin in large doses is accompanied by few or no reactions such amounts applied to the central nervous system may cause serious sequelae. Intraventricular, intracisternal, intracortical, and subdural injection of penicillin in man, monkey, dog, cat, and mice may induce convulsive manifestations, status epilepticus, and in some cases death (6). In order to study these phenomena in greater detail a series of experiments have been carried out in the macaque monkey.

EXPERIMENTAL METHODS

Animals. This study was carried out on a series of immature monkeys (*Macaca mulatta*). In one group of 10 monkeys under nembutal anesthesia 2 burr holes were placed on each side of the calvaria approximately 1.5 centimeters from the midline. The anterior hole lay over the premotor area and the posterior one over the postcentral region. In a second group of 10 monkeys 4 burr holes were placed in the skull on each side approximately 1.5 centimeters from the midline. The anterior hole was near the rostral extremity of the superior limb of the inferior precentral sulcus. The second burr hole was over the central sulcus near the junction of the arm and leg areas. The third hole was over the gyrus between the intraparietal and superior temporal sulcus—the anterior marginal gyrus—and the fourth over the striate cortex just posterior to the sylvian fissure (Fig. 1). After the wounds were healed penicillin in varying concentrations dissolved in 0.1 to 0.5 cubic centimeter of normal saline was injected through these holes into the cerebral cortex by a hypodermic needle. Following the injection the animals were observed continuously for at least 1 hour by two observers and at interval thereafter for 5 to 6 hours.

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The work described in this paper was done under contract recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Chicago.

Penicillin. The penicillin was provided by the Office of Scientific Research and Development from supplies assigned by the Committee on Medical Research for experimental investigations recommended by the Committee on Chemotherapy and Other Agents of the National Research Council. Commercial penicillin made by 10 different manufacturers in the forms of sodium and calcium penicillin has been used; all specimens given similar results. Crystalline penicillin was the purified preparation containing 1,677 Oxford units per milligram of penicillin.

The antibiotic potency of the penicillin was determined by a modification of the agar hill method suggested by Fleming. The strength of all penicillin solutions used was tested, and considerable variation from the stated potency was found in some specimens. The determinations were usually run in duplicate or triplicate.

EFFECT OF INTRACORTICAL INJECTION OF PENICILLIN

The intracortical injection of 0.05 cubic centimeter of a solution containing 2,000 Oxford units of penicillin is followed by a characteristic sequence of events. Within 5 minutes the animal appears listless and becomes less active than normal. Then myoclonic jerking of the extremities or face contralateral to the side of injection appear. If the injection is made in the frontal eye or striate area, convulsive movements of the head, neck, and eyes occur, and the animal tends to circle with his body as the axis. If the penicillin is applied to the motor area, twitchings of the upper or lower extremities appear. At first the myoclonic movements are infrequent, occurring every minute or two, but they gradually become more frequent. The type of movement is not constant; generally flexion of the extremity predominates, the distal part being most prominent but at times extension or abduction predominates. Usually, however, the movement is stereotyped, and its pattern changes only slightly after 10 to 15 minutes the individual myoclonic twitch gives

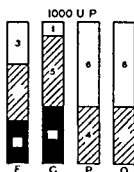


Fig. 3. Effect of aging on penicillin potency. The y-axis represents the percentage of calculated potency, with a scale from 0 to 1000 U P. The x-axis shows four bars labeled F, G, P, and O. Bar F is solid black with a value of 3. Bar G is hatched with a value of 5. Bar P is solid white with a value of 6. Bar O is hatched with a value of 6.

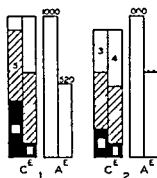


Fig. 4. Effect of autoclaving on penicillin potency. The y-axis represents the percentage of calculated potency, with a scale from 0 to 1000 U P. The x-axis shows four bars labeled C1, A1, C2, and A2. Bar C1 is hatched with a value of 3. Bar A1 is solid white with a value of 1000. Bar C2 is hatched with a value of 3. Bar A2 is solid white with a value of 1000.

In these two sets of experiments the convulsive responses are precisely what would be expected if the antibiotic factor were the same as the convulsive factor. The two factors were diminished proportionately by aging.

Inactivation by boiling. In 3 sets of experiments the effect on the convulsive response to boiling of the penicillin solution was determined.

In the first set of experiments the penicillin solution was boiled for 30 minutes in a water bath. Injection of a calculated 1000 Oxford units in each of 10 monkeys produced 1 generalized and 1 unilateral attack. Assays of this penicillin showed its potency to be about 63 per cent of the calculated value.

In a second set of experiments the penicillin was boiled for 1 hour. Injection of a calculated 1000 Oxford units into 10 monkeys induced no convulsive phenomena. Assay of the penicillin solution showed it to be about 10 per cent of its calculated potency.

In the third series the penicillin solution was boiled for 30 minutes in a water bath and subsequently made up to its original volume. Injection of a calculated dosage of 1000 Oxford units of this solution in 9 monkeys produced 4 unilateral seizures instead of 2 generalized and 4 unilateral fits as induced by the same calculated dose of untreated penicillin. The penicillin solution on assay was found to have about 10 per cent of its calculated potency (Fig. 5).

In these 3 sets of experiments boiling the penicillin solution caused marked alterations in the antibiotic and convulsive factors. The decrease however was not quite proportional in the third set of experiments the antibiotic factor was decreased more than the convulsive and the reverse being true in the first set of experi-

ments. In the second set the antibiotic and convulsive factors were proportionately decreased.

Inactivation by autoclaving. In 3 series of experiments the penicillin powder was autoclaved for 1 hour at 240 to 250 degrees F. It was then dissolved in normal saline.

In a first series a calculated 1000 Oxford units of penicillin was injected in 10 monkeys and induced 2 unilateral fits. With untreated penicillin in this dosage 4 generalized and 5 unilateral attacks usually resulted. A assay of this autoclaved penicillin showed its potency to be about 10 per cent of its calculated value.

In the second series of experiments a calculated 1000 Oxford units was injected into 10 monkeys inducing 1 unilateral fit instead of the 4 generalized and 5 minor seizures. Assay of the autoclaved penicillin showed its antibiotic potency was about 10 per cent of its calculated value.

In the third series a calculated 1000 Oxford units was injected intracerebrally into 9 monkeys producing 2 major and 3 unilateral fits as compared to 2 major and 4 unilateral seizures with untreated penicillin. Assay of this penicillin showed that its antibacterial potency was 99 per cent destroyed (Fig. 6).

In these 3 experiments the convulsive and antibiotic factors were reduced by autoclaving the penicillin. In the third experiment the antibiotic factor was reduced much more than the convulsive but in the first and second sets of experiment they were proportionately reduced.

Inactivation by dialysis. In two sets of experiments the penicillin was inactivated by dialysis as described by Stanley. Injection of calculated 1000 Oxford unit produced no seizure in either set of experiments and the antibiotic action was found by assay to be reduced more than 99 per

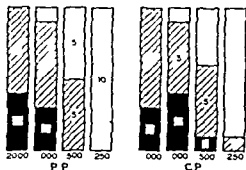


Fig. 3. Histogram showing the convulsive response (generalized fits—solid black; unilateral twitches—white) to the intracerebral injections of crystalline penicillin dosages from 2000 to 250 Oxford units. The abbreviations used are: PP, parietal; CP, cerebral; G, generalized; U, unilateral; C, convulsive; E, electrical; S, seizures; T, twitches; F, fits; R, results. These bar charts and symbols are used in Figs. 4, 5, 6, 7, 8, 9.

Effect of site of injection upon convulsive manifestations. Since the electrical excitability of various parts of the cerebral cortex varies it seems probable that the convulsive effect would depend to some degree upon the site of application. This hypothesis was tested by injecting 1000 Oxford units of penicillin dissolved in 0.5 cubic centimeter of normal saline in each of the eight burr holes of the second group of monkeys. When the frontal burr holes were injected 3 of the 10 animals had generalized convulsive seizures and 4 developed unilateral attacks. When the injections were made into the motor cortex (second burr hole) 4 major attacks and 5 minor unilateral fits resulted. Injections into the parietal cortex induced only 4 unilateral seizures. When the drug was applied to the striate cortex 4 unilateral fits occurred. It is then obvious that the reactivity of the cerebral cortex to penicillin follows closely the electrical excitability of the cortex. It is apparent that introduction of the drug into the cortex of area 8 and area 4 respectively induces the greater convulsive activity. Application of penicillin to the motor area is perhaps more likely to produce fits than its injection into area 8 (Fig. 3).

The convulsive threshold of individual monkeys. In a group of 9 monkeys over a period of 2 months 1000 units of penicillin was injected into the cerebral cortex 10 times in each animal. The injections were repeated at the same burr hole. In any one series of injections however all were made through the same burr holes so that the reactions of the animals are comparable. The

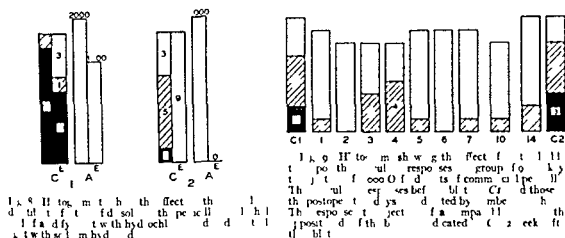
in the first animal half from 3 to 5 seizures from the 10 injections. One animal had 3 major and 4 unilateral attacks. One had 1 unilateral and 2 major fits. There is no apparent correlation between the size or weight of the animal and the convulsive response. While in a large series of experiments the susceptibility of the individual will reveal itself in a test of only one or two injections this susceptibility may not become apparent. Thus in 1 animal generalized epileptic seizures were induced by 500 and 2000 Oxford units injected in the motor region on 2 occasions—but on a third occasion 1000 Oxford units injected in the same area produced no clinical convulsive phenomena. Repeated injections through one burr hole will at times decrease the convulsive diathesis so that the same hole cannot be used for more than 10 to 12 injections without its convulsive threshold changing. Probably this increased resistance to a convulsive response is due to scarring in the cerebral cortex and not due to an antipenillin factor for injection in another site induces fits as before.

CONVULSIVE FACTOR AFTER INACTIVATION OF PENICILLIN

In the hope that the convulsive factor might be separated from the antibiotic factor of penicillin the effect of various methods of inactivation of the penicillin on the convulsive factor was studied. The following are the techniques for inactivation which were employed: aging, autoclaving, boiling, acidification with citric acid and dissolution in alcohol.

Inactivation by aging. Two sets of experiments were carried out with penicillin which had remained in the icebox for some time. In the first series of experiments penicillin which had aged for months was used. A calculated dosage of 1000 Oxford units was injected into each of 10 monkeys. One generalized and 5 unilateral attacks occurred in this series as compared to 4 generalized and 5 unilateral fits when fresh penicillin was used. This penicillin was found to contain 52 per cent of its stated potency so actually the injection had contained only 520 Oxford units.

In the second series a group of 9 monkeys was given penicillin which had remained in the icebox 7 days. An amount equivalent to a calculated dosage of 1000 Oxford units was injected in each animal. Instead of the previous response of 2 major and 4 minor attacks 1 major and 4 minor fits resulted. By assay the penicillin was found to be only 60 per cent potent. In other words the injected solution contained only 600 Oxford units (Fig. 4).



are given in Figure 9. It is obvious that except for the third and fourth postoperative days the convulsive threshold was much higher than that preoperatively. We are therefore inclined to believe that the cellular reaction and inflammatory change about a wound of the cerebral cortex protects it from the convulsive effects of penicillin probably by preventing the diffusion of the drug.

ELECTROENCEPHALOGRAPHIC MANIFESTATIONS OF THE CONVULSIVE EFFECTS OF PENICILLIN

The alterations in the cortical potentials following intracortical and subdural application of penicillin have been followed by both electroencephalography and electrocorticography. To eliminate artefacts due to muscular activity for the latter type of study the monkeys have been curarized and respiration maintained artificially. This procedure as well as the incision of the scalp has been carried out only after thorough infiltration of the skin by 1 per cent novocain. Small perforations made in the bony calvaria all well the insertion of screw electrodes 40 firmly attached. Movement artefacts were eliminated. The electrocorticogram was obtained from needle electrodes inserted in the muscles of the torso of the limbs. The amplifiers used for augmenting the electrocorticogram, electroencephalogram and electrocorticogram were two independent penicillin-coupled machines with direct coupling between the latter two, the working interval being 10 to 200

When the penicillin injected into the cerebral cortex no detectable change in the cortical activity was seen for 15 minutes. Then the level about the site of the injection slowly began to rise and after 10 to 20

microvolts amplitude began to appear and recurred every few seconds. After 1 to 2 minutes the spikes became coupled and practically synchronous spikes appeared in all leads from the side on which the penicillin had been applied. With small doses of penicillin little abnormal cortical activity was present on the opposite side of the head although with large doses of penicillin (2000 to 10000 Oxford unit) spikes appeared within a few minutes in leads from that side of the calvaria. Spikes increased in frequency and tended to group themselves into runs or bundles of 6 to 8 irregularly paced spikes. These runs increased in length at times lasting for 1 to 2 minutes (Fig. 10). Even such lengthy fits were unaccompanied at times by a distinctly abnormal electrocorticogram on the side opposite the injection. Usually at first the spikes forming a long run would be fairly regular at a frequency of approximately 10 per second. As the attacks increased in frequency and eventually the regularity at the beginning of the seizure became less pronounced an escape way to a disorderly series of large amplitude spikes. Toward the end of a seizure initially there was a tendency for especially large spikes to occur at intervals of approximately 0.5 second. Later this phenomenon would frequently be observed. At the conclusion of a seizure the cortical activity was markedly diminished. When the attacks had been recurring for an hour or more the cortex was usually isoelectric for 30 to 40 seconds after the individual fit. Then spikes appeared at first every few seconds but rapidly becoming more frequent and finally occurring almost continuously. As the attack progressed the spikes became of larger amplitude and greater frequency. After 1 to 2 minutes of high amplitude rapid activity the



Fig. 5. Effect of boiling on the dry penicillin series. The three series of experiments in these series of experiments are shown in the figure. The effect of boiling on the dry penicillin series is shown in the figure. The effect of boiling on the dry penicillin series is shown in the figure.

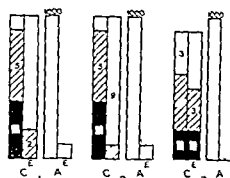


Fig. 6. Effect of boiling on the dry penicillin series. The three series of experiments in these series of experiments are shown in the figure. The effect of boiling on the dry penicillin series is shown in the figure. The effect of boiling on the dry penicillin series is shown in the figure.

cent of its calculated value. The convulsive and anticonvulsive factors are obviously about equally reduced by the treatment with dilute (Fig. 5).

In addition, by the method of dissolving penicillin in alcohol, alcohol decreased its anticonvulsive power. In a series of experiments an alcohol solution of penicillin calculated to contain 2,000 Oxford units was injected into 9 monkeys. Such a dose of untreated commercial penicillin had previously been given to 8 major and 1 minor attack. In this experiment 3 major attacks and 1 minor attack occurred. The penicillin was found by assay to have approximately 90 per cent of its calculated potency (Fig. 5).

Acidification of the penicillin by concentrated hydrochloric acid with subsequent neutralization by sodium hydroxide was found to abolish both the anticonvulsive and convulsive responses in experiments with 9 monkeys (Fig. 5).

In general inactivation of the penicillin produced a proportionate decrease of anticonvulsive and

convulsive factors. However the results (auto-claving in one series of experiments and of boiling in other series of experiments) suggests that the two factors may be differentially influenced. The more susceptible factor appears to be the anticonvulsive.

INFLUENCE OF THE CONDITION OF THE CEREBRAL CORTIX ON THE CONVULSIVE FACTOR

Although penicillin appeared to induce the convulsive state in experimental animals reports of such complications in clinical use were very infrequent. Even when the drug was instilled into wounds of the cerebral hemispheres no ill effects developed (4). It seems possible that the lack of convulsive complications in the human cases might be due to the fact that the drug is being administered to abnormal and frequently sclerotic tissue. Also we had observed that if the cerebral cortex was destroyed by the injection of formalin (concentrated 37 per cent formaldehyde) subsequent injection of penicillin even in very large doses did not induce fits. To test this hypothesis after determining the convulsive reaction of the first series of 9 animals to intracerebral injection of 1,000 Oxford units of penicillin we operated upon each of the animals and removed the cerebral cortex beneath the right hemisphere, small pieces of brain in the left hemisphere. Penicillin was injected into the burr holes each day for the first 14 days and then on the 15th and 16th days. At the conclusion of this experiment the brains of the operated animals were injected near the normal with 1,000 Oxford units. It was shown that the general convulsive reaction had not changed. The results of these experiments

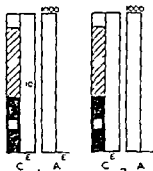
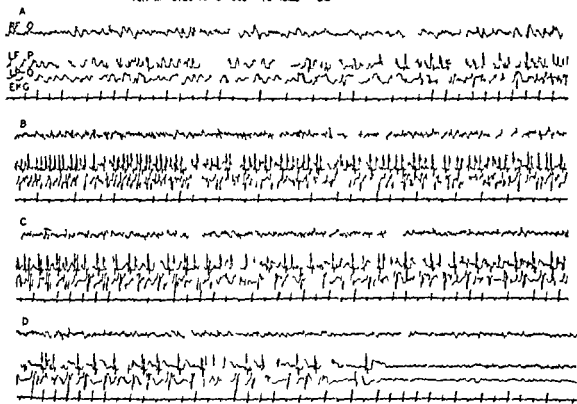


Fig. 7. Effect of boiling on the dry penicillin series. The three series of experiments in these series of experiments are shown in the figure. The effect of boiling on the dry penicillin series is shown in the figure. The effect of boiling on the dry penicillin series is shown in the figure.

TEN MINUTES AFTER 500 MG CELL L.C.



M 50

Fig. 1. A continuous recording of the left and right hemispheres of a patient with a focal epileptogenic lesion. The tracing shows a transition from a normal background to a high-amplitude, rhythmic spike-and-wave pattern, characteristic of a focal epileptic seizure. The tracing is labeled "M 50" and "Figure 1".

seen in the electroencephalogram were manifested clinically by the twitches or jerk of the extremities. When the spikes become continuous the contralateral extremities exhibit a clonic seizure stopping when the spikes cease. When the spikes appear on both sides of the calvaria the seizure becomes generalized. Again the bilateral discrete spikes are associated with twitching of the extremities and when they become continuous clinically a clonic seizure occurs. Following the generalized attack the inactivity of the cortical potentials corresponds to the postepileptic stupor or coma. As the cortical activity reappears the animal begins to regain consciousness.

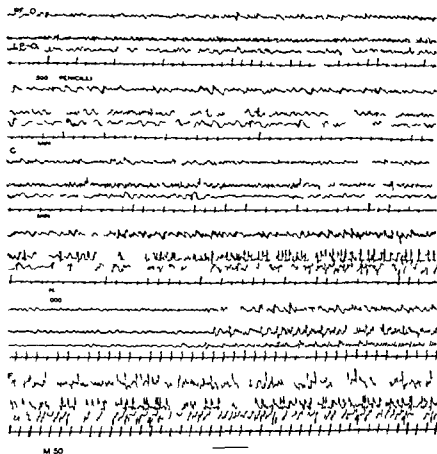
Not infrequently following a unilateral attack a paralysis of the involved limb or limbs (Todd's paralysis) is noted. This condition has an electroencephalographic correlate in the diminished or absent cortical activity in the opposite motor area. When the unilateral attacks are frequent both the paralysis and decreased cortical activity

may persist for hours. As a corollary the activity of the cortex at the site of injection and of the contralateral extremities may be less during a major or general attack than that of the opposite cortex and ipsilateral extremities.

DISCUSSION

It was thought possible that the convulsive manifestations produced by the application of penicillin to the cerebral cortex might be due to impurities in the commercial penicillin. However, as more and more commercial preparations were tested and all gave predictable results, and as the various methods of inactivation in general affected the antibiotic and convulsive factors approximately proportionately, it seemed more likely that the penicillin itself was the responsible factor. When pure crystalline penicillin was administered subcutaneously, this was proved correct. The precise nature of the chemical reactions involved remains to be determined.

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spikes became irregular and usually suddenly stopped. At times the end of the attack was less abrupt consisting of bursts of spikes of diminishing frequency. At the end of the attack the cortical activity was frequently abolished for

minutes until another attack started. We have followed such serial attacks for as long as 14 hours (Fig 12).

The electrocephalographic and clinical manifestations may be correlated. The initial

tration of the drug in the subarachnoid fluid over the brain probably much less.

The systemic administration of penicillin even in large doses rarely causes appreciable amounts of the drug to reach the spinal fluid. It is true that in some cases the administration of penicillin may alter the electroencephalogram (7) however we know of no instance in which a fit has taken place.

The local application of penicillin to the cerebral cortex and its injection in cerebral abscesses has been practiced without apparent adverse effect. Since a layer of scar tissue or a pyogenic membrane prevents the rapid absorption of penicillin the likelihood of convulsive manifestations would seem minimal. It is noteworthy that the penicillin may remain in brain abscess cavities for many days without apparent ill effect.

SUMMARY

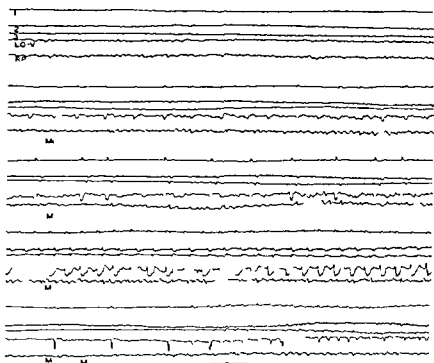
Penicillin may induce convulsions in monkey and man when applied to the cerebral cortex. The effect is not due to impurities since crystalline

penicillin causes the same effect in equivalent doses. The convulsive threshold is lowest in the motor area, higher in the premotor and frontal regions and highest in the occipital and parietal cortex. Inactivation of the penicillin usually affects the convulsive and antibiotic factors proportionately but a few exceptions have been found. Electroencephalographic manifestations accompany and may be correlated with the clinical convulsion.

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Fortunately the convulsive manifestations are induced only by doses much larger than required for therapeutic purposes in most cases. A level of 0.5 unit per cubic centimeter of spinal fluid is quite sufficient for the antibiotic action of the drug—and this level is far below the convulsive threshold even for the monkey. It appears that in man still larger amounts are necessary for induction of seizures. Thus Neymann has found that intracerebral injection of 30,000 to 50,000 units of penicillin in man may induce a status epilepticus with a fatal outcome.

We have observed convulsive manifestations following intraventricular injection of the drug (2).

Intracortical injection of penicillin in man may give rise to both electroencephalographic and clinical manifestations of seizures. On one occasion 5,000 Oxford units were injected into the

occipital cortex without reaction. But an injection of 20,000 Oxford units in the same electrode electroencephalographic alterations with out clinical concomitants (Fig. 12). Injected near the motor area of a child 10,000 Oxford units have given rise to twitching of the face and hand for 3 hours as well as to electroencephalographic manifestations of fits.

Lumbar intrathecal injection of penicillin even in large amounts has not induced convulsive manifestations probably due to the fact that the diffusion of the drug is slow and its absorption rapid. Hence the concentration of the drug in the cisterna magna rarely reaches a concentration greater than 1 per cent of the injected amount (7). Even though 100,000 Oxford units of penicillin were given in the lumbar region the cerebrospinal concentration would not be higher than 1,000 units per cubic centimeter and the concen-

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fect have been included in methods of the examinations for a virological examination for the functions of the tests are amino acids, blood and urine for hormones and vitamins also the preparation of the plasma and serum for transfusion. The section on parasitology and mycology has been enlarged and greatly improved by the addition of a new volume. The new modification of the Wassermann test and the clinical tests of Boerhaave and Lusk and of Mazzocchi are added to the section on serology.

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H.W.P. THOMAS J. A. KAHN M.S.
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ard well educated doctors to the care of the wounded in this war. It is obvious that line Army officers that is to say the general staff of the Army are again making it difficult for the Medical Department to implement a policy which the Navy promptly effects because the Bureau of Medicine and Surgery has independence of action regarding purely medical matters. The Navy apparently is aware that young doctors must be attracted to its service by the educational and professional opportunities which it offers and that legislation and

regimentation can never accomplish the result which they desire.

Section 4 of War Department Circular No. 10 April 18, 1943, accomplishes nothing except a restatement of existing conditions. Whatever the purpose of the issuance of this circular the civilian medical profession should recognize that it solves none of the difficulties under which they served the Medical Department of the United States Army during World War II.

LOYAL DAVIS

SURGERY

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An International Journal of Surgery

FRANKLIN H. MARTIN, M.D.

Founder and Managing Editor 1905-1935

Volume 81

JULY TO DECEMBER, 1945

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C T F C. Epidermal Spinal Abscess

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f penicill in the m stoid cavity Of these 17
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wh l 6 remained well fter a s cond c rs f pe
c ll The r commended dose of the drug is 1 000
un is every ight ho rs for f ur days

Local applicati n of penicillin in the masto d cav
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t h therapeutic meth d is met m f ta
able He must exercise great caut in t d g
r s s g s mething th t will cry t l th f
t n t sympt ms and thus re der him t m l
fract ry t subsequ nt n ur psych t c
When ne po es an pl t n f th h l l l
l a d pred cts succes ful results from t tm t
wh h propo es tstitut th al a s th
nk f a th rapeut c failure d d l bl cry
st l at n of the pat e t s symptom

Th re are i stances hen d f ct f th
salivary gl nds the result f i rga les f
the p nph ral c et ry rves Th f ct eem t
ha e be substa tuted by pre t f rmal
sal ary fl h plocarp dm tr f
The flect f th drug a gm ted b th mul
ta ou i gests f th cid f r m gsalt num
chl r l Th i stit f f r m t tm t f
period f from thre t w k h b n f l l w d
n m pate s by a r turt r m l i ratio
Th t mechan m by wh h th result s brought
ab ut n t cl a l d r st f th r cellular
tm rat occurs pont co l med cam

t s st mulat of the salivary gl n is may fa r
an adjustment to no mal fu cti

O ga ic les ons of the central nervous syst
may produce a dysfunction f th salivary gl nd
but they are associated conspic uously with paral
ys s of other cran al nerves Th scant attention
given to the anatomy and pathological physiology
f the central path ays of th sec t ry nerves in
the past and our ac a lemic intere t i th s bject
are j st fcat n pe haps f r th s e dea or by the
authors to correl t our presen t kno l d e of th
anatomy with the fu ctio f thes pathways
N D FA ICA T M D

Sh ll nberg P L Denny E R and Pyle H D
P n i llin in Vincent Angina J Am M A
945 8 706

A cl cal study demonstrated that penicillin is a
remarkably effective agent in the treatment of Vin
cent s fect The efficacy of penicill n in Vin
cent s a g a s f importance not only because f
pec i sensitivity of Vincent s spirilla and the f i
f r m b cillus but also beca e penicill n is more
rapidly effect e than the methods h etofore a l
cated A f vorabl response was btai ed i all
c es treated locally The n l v l acteri log cal flur
occurred in a patient in h rg nisms of Vince t s
persisted eve after ele en d vs f local tre tm t
l though the pat nt was clinically cur d o th
f rth day f tr atment

In ca e the effect wa dramati in that the sub
ject e symptom of pa hal l ft ith n x h ur
after the start of intram scul r tre tme t The fact
that symptoms left w th n six hours after the on t
f therapy and that th h urly quantitive l
tr al study h owed a r p l d appe c f the
Vi ce t s rga isms while 15 000 u ts f f cll n
w re b g g n intramucularly every thr e h urs
f ht doses s gests that th is rap ly eff c
t method of t eatment of V cent s a g n Th
f rat f h pit liz ti on was much rel ced by
th s method f t eatment whe comp red with a l f
l z e lozenges hydrogen per xid a l sod m
p borate chrom c cid a d s l nitrat n l x
ph ars e hydrochl ride th rapy

The top cal application of penicill n a ce n
t at of 500 un ts per cub c c t m t f ur tme
daily is compl t ly and rap ly effect e as th
th rapeutic procedure i the tr tment f Vi cent s
fect As a result f ad et led to y f r pat nt
tu th adm istrati of 15 000 its
th e e h rs f r ht do es it is s ested that th
m th f f tr at m t w rra t e t ded tr l
C tr R M D

NECK

G l es T R d H tel r M B P n i llin i t l
Tre tment f Patl nt with Deep Infecti f
th Neck f A Otor Chc. 945 4

Ca es d H t h r bel pe l w l f
most l l a ent th tr tm t f pat t

pasm as n t th ht to be th onl cau f th
chemic d g erati in th n rve tru ks for the
only way in which this could h ppen o ld be by
xtens on of th a t rial pasm t the remon l vasa
n rorum Lewis and thers showed that a pressure
as low s from 60 t o mm Hg wa uff i nt to
block conductio n the nerve trunks and that this
block w s du to ischemia In most of the cases
under discuss on th re was a history of gr s swell
i g f th l mb nd a d layed app arance of a per
p eral nerve inj ry furth r the nerves ly ng
outs de f the de p fascia of the limb oft n escaped
which suggested that the pres. r of fluid exud te
and extra asated blood beneath th fa cia produced
condit ions similar to th se in Lewis xperiments
It w s suggested that th pressur be eath th deep
fascia plus the general an xi of the limb plu pos
s ble th ombos s in the veins and capillaries of the
nerves ll in olvi g a considerable length of the
trunks w s sufficient to abol sh conducti n and to
produce th clin cal picture d scr b d This may be
acquired by m cha cal direct injury to one r more
nerves

Recovery w s slow and depe d nt n regenera
tion Tre tment consi d of forti g a collateral
circulat n by h ting the unaff cted l mbs oxygen
therapy the inject ion of ant psmo lics such as
p pa rin para ert bral and intrathecal i ject ns
f n can p ri etal sympathectomy nd pos
s bly arteriect m Th u e of clo d plast r in th
p nce of swell g was r garded as p rticularly
d n c o s

The n tom cal nomencl t r mploy d ma
at some confusi n unless the reader has eco re
to a gloss ary of th ario s names gi e t th
n rves of th l and foot

ADRIE VER EGGHE MD

BRAIN AND ITS COVERINGS CRANIAL NERVES

Krem r M Phillips C G s d St nler M W
The D trib ti n of Sulfamerazine in the
Body Fi ld th R l ti on t Crani l l j ries
L f Lo d 945 243 495

Th l f drugs and espec lly sulfadiaz e a
f l po t a b t xtent to co trol i tracin l
f ct In t v s s l l ad az e has be nu d
l rgely i co trol g th nfecti n l k ly to follo
p n trat n f the dura b m les or by c mpound
fract es Th easo f th that e ept f r
ull p l am d l l d r aches t r r b o
p n l f u d the h best co centrati o th c r
brown all d l l b g between 60 and 80 p c t
f that f th blood le l Howe r i the h gh
blood and pi s l f c trations neces ry f
fecti etherap ex talizati on p t occu th
n r y tract h m t r r f c l l i n g
de n s p p s f th n n with urem Th
te c v t a r i cr y l l i zati n is ccentu ted b
th occas al eces ity f h drat g th gate t
M m th l s l f d a r a d d m th l l f d

xire ba bee tried with r gard t th te
int r f with th un r tract

Th art lecc c tu l m thyl i l h h
is kn wn s s l l am a th Th d r b r b
less t nde c v to cr y stall z t the ar r r t
whether the un e b stro gly acid r st rpl a s
line Bv c ntr le p r me t f the dru th raga l
to its d ages n l concentrati ns in the bl l
p nal fluid the conclu o as r ched that a c
centrat n of m r than fr m ot s m m l co
cc in th pi l l l u d n t ma ta ble B
a logy with sulf d z these p l l l l
are not l ely t be theray t ally f l c t

ADRIE VER EGGHE MD

Girner I Ophthalm logical Feat f l tra
crani l Ch rd m s d Allied Tumors f th
Clivu l f Op k Ch c 1945 33 39

Chordoma re tumors of the pr m t n t ch l
and th r f e theoretic ally capabl f apy a
anywhe e; the le gth f th ert bral c l m
The mo t comm n situati n i; th sacre v e l
regio but the e is lo n nt resting g p r
at th cranial end of the s t ebral a l l
reman s of the chorda dorsals are fo nd pe l l
n th b s l a plate t the sphen o c p t l i u t
or l u Less th n oo such tumors ha e b r
po ted t date

Th symptoms r headach sual d turba
n sal b tructi n a d pa t the n ck th
t nde cy for the ca l al n rves t b l l
p rticula ly n o e s de c en th gh the m
aris n the midl nde the pons F l d f t
m v b due to i l m nt f the opt c ham l
choked d c s o opt c t ophy m y o cu Ophth l
m ple as of ary g t t w r f u l a d g t
the s olveme t of th th d f th a d th
n rves The seventh r f c l nery w s l
n ol d w th the th C mpe n f th b
t m at th p e s r t the medulla r th f m
agnu m l e d t h m p a r s m ca e s l a
the e l cau ed by l w ly g tum r i t e l e
th th ppe c r v al rves

Fr m the r ntg st ndpo nt character t
l haped ot h may b f d s th b l r p l t
A e t cul gram may sh w le at n f th th l
e in l Tw ca e s f this c d it s d
quat ly epo ted C mple te m l f th t r r
is rat l v po s bl ADRIE VER EGGHE MD

Houseal R W and Gerbasl M J A Report 191
Cases of M ingococcu Infecti Admitted
t St ti n Hospit l Camp But r n rth
Carolin f m n mbe 1942 t S p t mber
1 1943) N York St H J M 94 45 37

The a th r s r port enes f 93 e s f m
g x c c f ct n d d cu the l cal p t
d th t ater n l the cases
Th p e t t th t l u ng W l l W l l
1933 ca e s f men g o c c al m n t s a
m tted t l ted States Army Hospit als w th r 835
d th m r l ty rat f 38 per e t

At the present time a mortality rate of less than 5 per cent is prevalent.

Some of the patients presented very mild symptoms. A little diagnosis was difficult without careful history. Others with severe reflex lightning crotchosis presented no difficulty upon clinical examination.

The various symptoms and signs and a useful measurement taken at this hospital to prevent late diagnosis were reviewed.

The patients were treated with sulfadiazine and sulfanilamide if blood appeared in the urine. Daily nonprotein nitrogen studies were made and when there was an elevation of the level of this factor, sulfadiazine was discontinued. Meningococcus antitoxin was also used. Addition to the sulfadiazine and this was believed to be a definite added safety factor in treatment. Three deaths occurred in the series of 93 cases, a mortality rate of 3.2 per cent. All of these deaths occurred during the first 10 patients admitted among the last 83 consecutive cases there. S. Leath, Hov. D. A. B. O. W. M. D.

SPINAL CORD AND ITS COVERINGS

W. A. J. I. and I. R. T. T. m. H. R. C. G. n. g. n. I. De mal Sinus a. a. Sou. ce. f. M. n. i. g. a. l. I. feet. R. P. o. t. of 2 Cases. 1 A. o. c. i. t. e. d. w. i. t. h. R. e. c. u. r. r. e. n. t. M. i. n. g. i. t. i. l. J. P. d. a. t. S. L. o. 045 7 79.

Concussion and malformation is rare. In dealing with it, the author is able to find only 7 cases published by Walker and By in 1934. The case described by O'Connell in 1932. Since the literature is so meager, the author reports all the cases found in the literature.

The first case was that of a white girl, aged 12 years, who was born with a skin lesion on the lumbar area, which was thought to be a congenital pituitary tumor. In September, 1930, January, 1931, and September, 1931, she developed pelvic abscesses, meningitis, and spinal cord tumor. On March 1931, a diagnosis of spinal cord tumor was made. The tumor was removed, and the patient recovered. The second case was that of a white girl, aged 12 years, who was born with a skin lesion on the lumbar area, which was thought to be a congenital pituitary tumor. In September, 1930, January, 1931, and September, 1931, she developed pelvic abscesses, meningitis, and spinal cord tumor. On March 1931, a diagnosis of spinal cord tumor was made. The tumor was removed, and the patient recovered.

In the skin over the third lumbar vertebra and a small opening at the coccyx, otherwise she was in good health. In October 1931, a sinus tract was traced from the dimple of the skin down through a list in the third lumbar vertebra to the duodenum. This was confirmed by microscopic study, revealing that the wall of the sinus was composed of dense collagenous fibrillar tissue, with a regular lining of degenerated calcifying epithelium, apparently of squamous type.

These two cases emphasize the necessity for early recognition and complete extirpation of the dermal sinus tracts. According to Walker and Huey, the development of a list of results from an incompletely cleaved ectoderm, cutaneous epithelial ectoderm, and neuroectoderm and an invagination of the neural tube. The ectodermal development of the neural tube, the sinus in the first case is explained on the basis that a type of fetal pathologic may develop as a consequence of development of the lumbar pathologic process.

T. Freeman, M.D.

SYMPATHETIC NERVES

Lill, G. D. Ale. I. I. Injection of Sympathetic Trunk. J. Am. M. Ass. 1945, 3: 479.

The author comments that the sympathetic system is the lumbar sympathetic system for patients with aortic aneurysm. In the lower extremities, it is the thoracic sympathetic system. The author reports that the results of treatment with the sympathetic trunk are good. The relief of pain by the sympathetic trunk is a remarkable result.

The technique of treatment, which has been described by Ochsner and DeBakey, with a few minor changes. It is recommended that the procedure be performed in the lumbar region, a percutaneous approach. The lumbar sympathetic system can be easily accessed for procedure. Hov. D. A. B. O. W. M. D.

MISCELLANEOUS

B. Id. F. St. I. lex. Steel Wire Mesh in the R. pal. f. Sm. II. Cr. I. I. Defect. A. S. G. 1945, 1: 8.

The author has modified the steel mesh for the treatment of the thoracic aortic aneurysm. The mesh is made of 65 mesh, 40 by 40 by 28 by 28. The mesh is placed around the aortic aneurysm, and the results are good. The mesh is placed around the aortic aneurysm, and the results are good.

The mesh is used percutaneously. The procedure is performed under fluoroscopic guidance. The mesh is placed around the aortic aneurysm, and the results are good. The mesh is placed around the aortic aneurysm, and the results are good.

d. btl whether pleural effusion is v r a primary disease. I r o of the series f 444 c es of fluid in th pleur leav ty r ported by the authors a definite diagnos was n t made yet there as cl cale i de ce to favor a d agnosis of eith r tuberculos s or neopl stic d sease in r s f these cas s. In the remain g 66 cases a diagnos s might ha been made if there had been an opportunity f r bservation or further stud es of the pleu al flu i.

It is important t emphasize the necessity f rare ful exam nation of th asp rate l y l u r al fl i. The gros character stics should be accurately ec d i a d the pecific g avity and numb r f cells shoul be d terminel. As arch for neopl t c c l l s e t h e r by the m th d r e v i s e d e s c r i b e d by the auth r or by th parafin sect on meth d sh ull be made. Bacteriologic l study sh uld i clude cultu es n suit abl med a an l frequently al i culation f g u e a g s. Wh the presence of chyl th rax s s u p e c t e d the fluid sh ld be sta ed vith s d n III shaken th ether and chem c l l y m a l y z e l f r s t.

In a consi rable number of cases it is l f f u l t t establish an act d ag s i s. In m s t s t a c e s i t i s e t s p e c t t u b r e u l s a n i t o t r t h e p a t e t c c d g l y.

HEART AND PERICARDIUM

N r m a H B a d A l n w t l R M St p l y l o c c a l p y p e r i c a r d i u m T r e t d w i t h P l l l l l B t J J 945 806

Becc penicillin has b n s c a c e d r p e t d l e c t o f t h i s d r u g a n e x c e e d i n g l y t r y i n g t a l b i t a t e d p a t e n t s t h e r u l t h l e c l a p p l c a t i o n w h e n e y r e t i s s u f f e r s h u b d b e c l p l a c e f t e m i c t a t m t l t s r g i e l t o o t h a t t h u s o f p c i l l i n d e s n t a v s e r p l a s r g i l d i a g l t h t h p i s f r m l a q u a n t i t y i n u t l e e c t e d f t h c a e t r b l s t a p h y l c e c c l i n f c t i o n o f t h p r a r d u m p r e d i n t h c u r s e o f a c e y s t y p h i l f c t i n. The e s u i n g p v o j e r i c i u m s u c c e s f l l t a t e d b y t h e r e p e t e d l t n f u s a f t h i l l a t i n f s l u m p n i l l t t h p r i c i a l a c.

The e c c u e n c e o f s t a p h y l c e a l p y p e c a r l m i t h c a e f a s t l i l a d y g a l y l l t h t y p h i f e r i r e c t e d. Th s u c c e s f u l t m n t p h t p e c i l l i p e n l p o w h i t e t p p o b l e t m i t a p e m t w i t h l q t c n c o n t r a t i n f t h l. Th r e r e p e c l i f f i c u l t n d a l g w t h t h f t e l p e c i m. I t i f f r u l t t o b e c e r t t h a t h j r a t h b d o e a d e q t l r a i a g f t h b h e d. W t h e r e i n f e c t i n f t h s p e r f i c a l f f t h c h e s t a l l t h d t s u r e t h t t h p e c a r d i a l s u e r t t m t e d w t h s e c o n d r s a l g r p a m h c h a r p e c i l l r e s t t l t h c a l e m p m t h r a m l l t t t t c o m m t g t e s l l g r o l y t h k f t a a l k l h e s t w l l k b r e c t m a y b e n e c e s s a r y t o r m e t s e f b s d e p o s t a

f o m t h e e m p v e m c a r t y. Th l r e s u l t s i n p v o p e r i c a r d i u m i n w h i c h t h e c p e f s u g e r y m l m t e d a r e l i k e l y t o b l e s s s a t f a c t r y. A t t e n t i n i s d i r e c t e d p a r t i c u l a r l y t o t h e l o n g p e r i o d l u r g w h i c h t h e r e a c c u m u l a t i o n o f s t r i l e j u s i n t h e p e r i c a d m p e r s t e d. B E J M G O L D M M D

ESOPHAGUS AND MEDIASTINUM

R i c h a r d n J R A N e w T r e a t m n t f r E s o p h g l O b t r u c t i o n D u e t o M e a t I m p a c t i n A O n d A b l 945 54 3

La g m s e s o f m e a t a n d f i s h w i t h a n l w i t h t b o c o c c a l l y l o d g e t h e s o p h a g u s a l l s t r u t t. Th s o c c u r s m s t o f t n i n p r s o n t h c o s t r i c t e d o r n a r r e d e s o p h a g u s. The a u t h r d c u s s e s a u m b r f c a s e s f t h s t y p e i h h t l m s e s c o n s t e d o f m a t w i t h o u t b o n.

The o n s e t f t h e c o n d i t i o n i s s u d d a l u r s w h i t h e i h i j a l i s e a t g R a l i n l e t l. S o m t i m e s m r p h l a s t h e n r m a l e s o p h a g u s s u f f i c i e n t l y o t h a t s u c h a m s m a y l l l n i n t t h s t m a c h. I f t r e a t m t i s g e n e r a l d e s t m. Th t k e s m e v n t f r t i s s c d g t h s f t h e m. I f t h j t t u r v i s e l t h u g h u a b l t s l l l u i d i f t h e e s o p h a g u s t l l s t l e c t i f e c t l p o t a o s r e c r y c a c c u l h r.

I f t h t t h l v s m d f e t t l e s o p h a g p e r f t l y e s c a l l f t l f t t h a s t e d e r a l d a y s b f r e k g l l. A l p r a t n u n i r d r e c t l f l l p r g b o d y c a b e r m d M e n t l y t p a h b u e d u c c e s f l l y t l s o l e i m p a c t i n t A m m r f e c e u t i c e h c h t m l p r e s n b e l r e p o r t e d i t t l. Th m j t y f t h e p t i e t c r e a t f f t h t l r t h l c a d e o f l i c. The t r e a t t u l w l e t a l d f e a c h c e 3 p a t i e n t e g i n p h n e l a t r p i n e w i t h n o a l n t g e. Th 14 t h r t i e n t s h l n m l e a t f n y s e r t t t h c p e c e t p p i n s o l u t. The r e s u l t s w r g r a t i f y i n g. The s o l u t i o n u l a s c o m p o d o f 5 p e c n t p p a l s o l v e d i n a o p e r c a l c o h l h e l s t o c k s o l u t n i l l k f r a g e l n t k. O n c u b i c c e n t i m e t e r f t h s e l t i n a l m t d r y f f t e e m i n u t e s l l g o o d r e s t l. O b e c t r i c c l i b e r a t i b y t h p a t t s h w e r e a l l t s l l w r i w h n a t p o o f l e l l b e t k t h m a t l e s t i m r p e d l. F W L C R m s r k M D

S h a f r J C o n g n i t l S t o r t E s o p h g C o m p l i c a t e d b y V i t m i n B D e f i c i e n c y G l r e J J 945 43 5

S h f e r e p o r t t h e c f a f r t y s r l l m w h o m p l l f p r a t r e p n a l a n p a 033 E s o p h a g u s r e l e d t t h t m l r a t e d r t h e l f t p o s t r w l l l c h e s f m t h t e e t h t l u m w e r t r r e d t s o m s h a r e s t o l T r e a t m t e c t e d t h a p p a c a t i o n o f m e a t t o t h

Plurals: 1 m t ften cau es e erefunct nal
mpairm t f lung wh e spar h mal les o s
m y h r lat el ltl flect n p lm ary fu
t n Dur p e moth ra t eatme t the collaps
ed lun fows a decrea e of oxyg n i take m ute
o'um tidal a nital capacity res rve and
compl mentary air Comp at n is ach e ed by
an i cr ase of the o ygen the oppos t lu
fhis is o l part of the res lt f ll wing n sed
ent lat n Oxyg n ntak furth ne ed by a
better utilizati n f the e tilated gen i ad
crease of the ventilat o equa l t

The rac pl sty cau es s mlar funct onal ch nges
s does pn um th rax but n the a era e these
changes are les seve e f ll w ng thoracopla ty than
a te coll p e by pneumoth rax Lun s r e p ded
aft r p mthorax tre tme t oft n show ext i e
functi nal impair ment

A change in the pat e t postu e from the sup ne
pos tion to th l ft o right s d does n t aff ct the
percentage d strbut on of the t l cap cty be
tween the l ft and right lu Att mpt at mm
biliz ng a hem thorax by sa d bags w s h n p t
z pou ds and by strappi g ith adhesi e tape do
n t prod ce a educt n f th ent l t on or of th
resp ratory wo l f the u d l v ng l ng

SURET KAN MD

Orth O S Wilhelm R L and Wat rs R M
The Q esti n f Pulm n ry Dam g with
Artificial R pirati n J T A S g 94 4

B cau e c nt olled resp rat on d ring erta n p
erati e procedu es s be ng sed in cr singly th ough
ut the country a compa n study f th v r us
pro edures b wh ch the lu gs may be ntilated
a u u taken Th ma n purpose was t d term n
wh het any d ms ewa d n t th lu s of labo
t r nimal by va o s f rms fa tificial spirati
d t correlate the anat o f press re occur
the appl cati o f th ral method w th s y
morph l cal ha ges that m y h been prod ced
s r v i perime ts re perf rm d D gs
d r mbatal amv t hl ral h frat a f
th d ethyl th r cy lop pa rt s
thes ere uby ted t p od fa tial esp
t n r e f om n t h urs Aft r t w
f u d that gross p lm nary dam as d t
th n two h rs and as gr ata that f ll g

six h u test period two-h ur per d w gr
ally used i th erma ng tests To corr lat t
cha ges f pressure produ ed by the vari us m t o
ith morph log cal cha es h ch might occu
the l ngs recordings we e mad of th ral br
cholar (pulmonary) a d intrapl ural pres res b
con ectu s to three separate me cury manom t rs
Som of the methods nvest gated n l ed th u

f pos t e p ess re l oth rs a comb at i
alternat g posit and negat e pres r These
methods er (1) m ual pressure a g l t r rubbe
bag () manual pres r on the th rax c ll (3)
t o-phase (pos t e negat e pres u) type f res
cutor (4) th Kreis lman bell s (5) the V f
L d apparatus (6) a Dri ker type f res c l (7)
a wind bu ld w per t p e f re p at r a d (8) the
E e rocker method Each f the ght methods w
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Report of the Second State Wide Survey of Acute Appendicitis Mortality in 1937

In this second state wide survey of the mortality from acute appendicitis the results in 196 hospitals in Pennsylvania as reported in 1937 are contrasted to those in the same hospitals in 1912. The mortality among the patients with spreading peritonitis following a perforated appendix in 1937 was 25.06 per cent whereas in 1912 it was 41.17 per cent. Several factors were analyzed in order to determine their relative importance.

In 1937 the average hours that elapsed between the onset of symptoms and the operation in 342 patients with perforated appendixes was thirty three and seven tenths hours whereas in 1912 in 2143 patients it was twenty two and two tenths hours.

The mortality of the patients who were admitted with a history of having taken antibiotics and were operated upon in 1912 as considerably higher than that of patients with similar history in 1937. In the 1937 survey there were 3,352 patients subdivided into 3 groups with spreading peritonitis 154 with localized peritonitis and 68 with appendiceal abscesses. The first group of 3,198 demonstrated that patients with localized process presented a mortality similar to that of those who were admitted with a frank spreading peritonitis. These patients were placed in the induced spread group which led to the conclusion that a diagnosis of perforation had been made. The mortality of 31.1 per cent for the localized peritonitis group was not significantly different from the mortality of 31.1 per cent for the spreading peritonitis group. The mortality of 41.1 per cent for the localized peritonitis group was not significantly different from the mortality of 41.1 per cent for the spreading peritonitis group.

In the 1912 survey patients were subdivided into three groups: localized peritonitis, spreading peritonitis, and abscess. The mortality of 31.1 per cent for the localized peritonitis group was not significantly different from the mortality of 31.1 per cent for the spreading peritonitis group. The mortality of 41.1 per cent for the localized peritonitis group was not significantly different from the mortality of 41.1 per cent for the spreading peritonitis group.

There were approximately the same number of deaths from the anastomosis in the 1912 survey as occurred in 1937.

With regard to surgical procedure the results reported showed that of 342 patients operated upon for appendicitis 154 (45 per cent) had a localized peritonitis, 68 (20 per cent) had a spreading peritonitis, and 120 (35 per cent) had an abscess. The mortality of 31.1 per cent for the localized peritonitis group was not significantly different from the mortality of 31.1 per cent for the spreading peritonitis group. The mortality of 41.1 per cent for the localized peritonitis group was not significantly different from the mortality of 41.1 per cent for the spreading peritonitis group.

In many of these hospitals absolute sterilization was instituted. The operation was deferred until a localized abscess developed. The appendix was not removed and the drains were not disturbed before the second day.

In contrast to this conservative routine a review of the results of management in the hospitals where an appendectomy was performed immediately regardless of peritoneal condition showed a consistently high mortality. As for example 70 cases of hyperacute perforation presented a mortality of 86 per cent. In 18 cases of acute perforation with a moderate hypermicropertoneum presented a mortality of 24.06 per cent. In 151 cases of subacute perforation with an enormous peritoneum presented a mortality of 23.35 per cent and 1080 cases with an abscess in which the peritoneum was thickened and elements presented a mortality of 12.2 per cent.

The question of draining the peritoneal cavity in peritoneal peritonitis is answered by the statistics. In 1937 126 patients with appendicitis presented a drainage with 74 deaths (58.73 per cent). In 1912 34 urgeons removed the peritoneum with 41 deaths with appendicitis peritonitis with drainage a death rate of 62.5 per cent. The fact that urgeons had treated drainage of the peritoneal cavity in 1937 for 68 per cent for comparison.

The 2153 patients who had acute peritonitis presented the exact number of deaths in the same number of patients in the peritoneal cavity. However the number of patients who died with the diagnosis of peritonitis was 14.7 per cent. In this group the weight was 14.7 per cent. The mortality of 14.7 per cent for the peritoneal cavity was not significantly different from the mortality of 14.7 per cent for the peritoneal cavity. The mortality of 14.7 per cent for the peritoneal cavity was not significantly different from the mortality of 14.7 per cent for the peritoneal cavity.

In the 1912 survey the mortality of 14.7 per cent for the peritoneal cavity was not significantly different from the mortality of 14.7 per cent for the peritoneal cavity. The mortality of 14.7 per cent for the peritoneal cavity was not significantly different from the mortality of 14.7 per cent for the peritoneal cavity.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

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EDWARD L. C. R. ELL, M.D.

Woodb ry R A Ab B E T r p t R d
F r i e d P G N o t m i n M t h y l u l f t f r
P r e l i m p s a J m M t 1 945 3 5 4

Schocka t l Lamb l l n l D k m a l
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m b t e c t y l c h o l e a n d p r e s s h h l l
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a l t e r e d r a b n m a l e c l a m p t c t e m

Th t u r a l o c c r r n a c t i v l h c a b e p o t
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r o r m f m e c u r y

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p r e s e t

SAMUEL J. FOG 150 M.D.

d p e t l a n l t e d t h h t t h e p r o c e s s f
l p o t T o f i n d l i n n r c a l c u l e n t
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o c c u r r e c e o f s u l f a m i d e d n a t e s a c a l c u l h a s
r e c e n t l y b e e n r e p r t e d f o l l o w t h e t r a p e t c t
f t h e s e d r u g s O r g a c s u l f r d d n o t t t t h
c a l c u l s d e s c r i b e d T h e s u l f r w a p r e s t e n t u r e l y
i n f m f m h c h e e f t r s t r o g a s h i n g
h y d r o e n s l u d v a r a d l l b e r a t e d b y t r t m e n t
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s u l d

T h c a l c u l u s a s c m p o e d c h i l f c a l c u m
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p e s n e d J m E F r r t a t M D

BLADDER, URETHRA AND PENIS

J c o b s o n G E J \ u r o g n i c V e s i c a l D y s f u n c
t i n f l f B l t 945 53 6

I t h e p a s t t e n r t w e l e y a r s c o m e o f t h e c o n f
f n f r m e r l y s s o c i a t e d w i t h r e g n e c e s c a l
d y s f u n c t i n h s b e e n d i s p e l l e d A t e t a t e c l a s s i c a t
n a t n o f n u r o g e n c v e s i c a l d y s f n c t i n h a s b e
b a h t f o r w a l a n d m o r e r a t o l m e t h o d o f t e a t
m t t h a n t h s f m e r l y u s e d h a e b e a d o p t e d
H w e r c o f u s i o n s t l l x s t s e g a r d i n g t h a c t
n a t t h e a n o u s t y p e s o f n e r g e n c v e s i c a l d y s
f n c t n a d t h e l e s n o r l e s r s r e s p o n s b l f r a c h
t y p C o n s i d e r a b l e d i f f e r e n c e f o p n i o n a l s o t
e g a r d g t h e e l e m e n t f c y s t o m e t r y c y s t s
c o p d r o n a p h n t h e d a e n s i s f u o g c
e s c a l d y s f u n c t n

T h e p u r p o s e o f t h i s s t u d y a t a c e r t t h
a t u r e a d f d a m e t l c h a r a t i s t i c s f t h a s
u s t y p e s o f n u r o g e n c e s c a l d y s f n c t n s p r o d u c
d t h e e x p e r i m e n t a l a n i m a l a d t d t m e
s o f r a s p o s s i b l t h e n e o l c a l l e o o r l e s
e s p o s s i b l e f o r e a c h p a r t i c u l a r t y p e o f e s c a l d y s
f n c t i o n A n f f r t a l s o a m a d t o v a l u a t e t h e
m e t r i c f c y s t o m e t r y n t h d a e n i s o f t h e c d i t
t n T h e s t a t u s f t h u p p e r p a r t o f t h u r
t r a c t n i t h e h a n a p p e a r s e o f t h b l d d e
w r e s t d i e d l

N u r g c e s c a l d y s f u n c t n s p r o d u c e d
p e m e t a l l y n t h f m a l d b y s c r t f t h
h y p o g a s t r i c d i l o r e s b y d i f f e r e n t i a l c
t n f t h a t r n d p o s t e r s a c r a l e r v e r o t s
a d b y t r a c t n f t h e c a d q a d p l
c o d

I t w a t f m p e m e t i s s t a t
t h e e d a t t t y p s o f e s c a l d f
t n o c c u r t h e p e s e o f p e r m i t t l e s s f
t h t r i c r n p p l s f t h b l d d d f t h
p l e o d T h e s h a b e r f r e d t t t h e
t o b l a d d () t h u t m b l d l a f g
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T h e a t c b l d t h e l t f l e s
l e s o f t h p o t r s a c r a l a u t p o s t r s a c r a l
r o u t g a w b b l t r f t h t h

m a l t r a s m i o n f s o r y o m l e s f m t h l l
t o t h e s p a l e n l T h e e s c a l f a b l t t h u g a
t u l a t y p e f d y s f n c t i o n i s a l l p e r m a c t a l
r e s l i s t m p r o l o n g o e d s t e t n a n d l s f e s
t a l t o c a u s e d b i n t e r r u p t n f t h e s a c r a l (a l)
r e f l e a r s

T h e t r i c b l a d d e r i s c h a r a c t e r i s t i c f w i n t r a
e s c a l p r e s u e l r e c a p a c i t y a d c o m p l e t a b s e c e
o f a y w a e s o f c o n t r a c t n t h e c y s t o m e t r o r a m
A l a r g e r e s i d u u m f u n r e i s a l y a p r e s t e d i n
c o n t i n e c e i s o f t h e o e r r o w r p a r a d t a l t p e

T h a u t o m o u s b l a d d e r i s t h e r e s u l t o f a l e s n e
l e s o s f t h s a c r a l p o t f t h s p a l c o d t h
c a u d a e q u i n a o r t h e p e l i c n e r v e s (t e n r s a c r a l
r o o t s) w h c h s e r i o u s l y i n f e r e w t h r m a l m o t

e r v a t i o n o f t h b l a d d e r A s a r e s u l t f t h l o s o f
t s e t r a n s i c i n n e r v a t i o n w l l t r e g r a t l a d s
t a n e d c o n t r a c t s o f t h e d e t r u s m u s c l e r e n
l o g r p o s s i b l a n d l y f e e b l a n d i e f f e c t
t r a c t i o s o c c u r (a u t o m o u s c o n t r a c t i o n s) T h
a u t n m u s a c t y r e p r e s e n t s e i t h e r a n r h r t
p r p e r t y f t h s m o o t h m u s c l f t h e s c a l w a l l t
l l f r e f e a c t i t y w t h n t h v e s c a l w l l r w h t h
n t n i n i e n r v p l u s t h e p l v c p l u s o b o t h
p l a p a r t

T h e t o m s b l d d e r i s c h a r a c t e r i s e d b y
e a d e t n d e c r e a s e d c a p a c i t y a d c h a r a c t e r i s t
s e s f a t o m o u s c o n t r a c t s s i t h e c y s t o m e t r o
r a m R e s f u a l u r i i s u s u l l y p r e s e t a d n
o n t i n e c m a y b e o f b o t h a n a c t i v e a d a p a r t
e r t y A l u n t r y c o n t r o l o f u r t n s s e s t a
e s c a l s e n s a t i o n s u l l y s m p a e d A s a c o e
q u e c f t h a t n o m s a c t i t y o f t h e d t r u s m
m u s c l e c n s l e r a b l w k h y p e r t o p h y o f t h e
c a l m u c u l t u s d e e l o p s L t r a l l e s o f t h
s a c r a l r v e s r e s l t n l a t e r a l h y p e t r p h y o f t h
d t r u s l e a d n s o m d e c a e n v e s c a l
c a p a t

T h a u t m a t e o r r e f l b l d d e t h r e s u l t f
a l e s n f t h p n a l c o l w h i c h s t u a t d a t a t h
s a c r a l l e l a n d w h i c h i n t e r f e r e s w t h t h e c r t c o
p l p a t h a y s (f l n c f h b t) t t h
n a r y b l a d I n s u c h c a s e s t h s a r a l r e f l x r e
e t h s o c a l l e d m e t u i t r e f l e n t c f t h
b d d r s c a p a b l e o f r e s p o d n w t h t h l l s
t n d n d w l l c o o d a t e d c o t t f t h
d e t r u s m u s c l e

T h u t m a t e o r e f f l l l a t e r c h a r a c t e r d
t h d e c a d c a p a c i t y i c r s d t n d c h a r a c t
t r i s t c w a v e s f a t m t r f l c t r a c t
t h y s t m e t r o g r a m R e s l u l i s s l y
p e s e n t a n d t h c t i s f f t e i p e n
a d t y p e o c c u r r a t m t t e t h h t h b l d r
h e s c r t d g r e e f l l l A l l f n t r y e
t l f r n a t l o s t a l m s f t l l e s i
s a t n a b a n t

D l a t i n f t h t r s l l l y l y w
f d s o c t t h t n s t y p e
u e s l d f n c t i o n T h s w a t t b t
t m e c h a c a l p h y s l o g i c a l b a s t r u c t t
t e s c a l j u c t i o n w h h r e s l i e d f m h y p e
t f h f h p e r t i t y o f t h e d t r u s m

The possibility of incompetence of the ureters is calculated like mechanism (urter = es cal r fle) h n t been entirely excluded. The dilatation of the upper part of the urinary tract was found as a consequence of the anatomical reflex type of urodynamic changes. The dilatation of the urinary tract is associated with the type of neurogenic vesical dysfunction. This probably was the result of prolonged uric acid in the bladder and the gradual breakdown of the ureters es cal r sph c like mechanism.

Section of the hypogastric nerves a result of the lumbar sympathetic ganglia result in a temporary decrease in vesical capacity and increase in vesical tone. This emphasizes the fact that all important innervation of the bladder is the thoracic and lumbar sympathetic nerves.

The cervical neck was normal in the autopsies. The type of neurological dysfunction is highly variable and relaxed in the tonic type and usually somewhat contracted in the hypertonic in the autopsies. The admittance is difficult however to accurately determine the degree of relaxation in the internal vesicular mucosa. It is generally normal in the autopsies and in the types of neurodysplasia but is met in the autopsies. Considerable hyperphysiology is observed in the autopsies of the tonic type of dysfunction. The reticular areas were normal in the autopsies of the functional normal in the highly dilated in the autopsies of the autopsies of the elongated in the autopsies.

Cy t m t r y u f l i n t h i a g n s s a l l f r
t t n f g e c e s c a l y s t t h
j e m e t l n l T h f t h r t h t l y
l e n t v i e s c a l y s t t m y f d
i m l r i f t a l t a l y s t m e t r g r a m s f f n t
r a o n t h a t h y l d b e u l t h t
c l a q u a t k I o f b i r M D

From the Study of the Etiology of
Ulcer of the Stomach 1945 53 83

[illegible]

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Six rats were fitted with a short tail perf rat. The treatment of these cut tails was compared with that of h morriage and q ate w ary dra n d tei e r t p a t i n n h test n l a c t n o s t a i s

rest of the world is
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The following per gallon recommendations are based on a spray application of 100 gallons per acre. The actual amount of product to be applied will vary with the spray application method used. For example, if a backpack sprayer is used, the amount of product to be applied will be less than if a tractor-mounted sprayer is used. The following recommendations are based on a spray application of 100 gallons per acre.

total of 35 000 O f rd units and local therapy became culturally negative for the nation. There were thus only 14 patients who continued to have urethral discharge due to secondary infection.

The complications in this series consisted of 8 instances of gonorrheal arthritis and 15 of acute epididymitis in these patients penicillin did not have a specific effect.

Except for the development of mild urethritis in 5 patients there were no complications following the injection of penicillin.

JOHN W. BEEVAN, M.D.

McLaughlin, C. P. Lymphogranuloma Inguinale in the Royal Air Force. *Lancet* London 1944; 80.

A series of 50 cases of lymphogranuloma inguinale among white airmen in the West Indies is described.

Even when the clinical diagnosis was clear the Frei test was often slow in becoming positive and was sometimes persistently negative. The author states that it can become positive during chemotherapy.

Of 26 cases treated with sulfamidobenzamide 21 responded well.

The slow healing of advanced cases is attributed to the disturbance of lymphatic drainage rather than to secondary infection.

Surgery is justified in late cases which do not respond to sulfamidobenzamide.

Since the healing of an abscess usually was retarded by both diminished lymphatic return and inadequate external drainage some surgical aid was

considered logical. The usefulness of a catheter has rightly been stressed and 12 of the patients were so treated. In 1 patient it was necessary to remove pus on 5 occasions—infect the author regarded this as the first line of attack where fluctuation was found. However, only 5 of the 22 men recovered without surgical treatment and the need for radical surgery in spite of strict precautions. The local injection of drugs was not tried.

The reason for these failures was later clarified. At operation large numbers of inguinal gland showing intense fibrous perianitis and containing a focus of pus of connective tissue material were found. When such cases did not respond to conservative measures a deep skin appeared characteristic of erythema multiforme so perianitis was considered as a factor.

Under general anesthesia the incision was made (or the surgical pen) and the affected area exposed and debrided. The associated local infection entered and urinated much as a breast abscess. Itated beneath the skin only the danger of infection by altho issues of infection the necrotic zone readily felt. Usually the necrotic zone was debrided and a drainage tube placed.

Sulfamidamide powder is then packed into the wound and kept in contact with the tissue (Vaseline gauze). This was used with the last patient a different 5 days. At the address glands red granulating surface was found and drainage gauze were applied. The drainage continued for 11 days taking an average of fifty days.

J. A. L. M.D.

SURGERY OF THE BONES JOINTS MUSCLES TENDONS

CONDITIONS OF THE BONES JOINTS
MUSCLES TENDONS ETC

Casley J and Silberman W A. Infantile Cortical
Hypotonia: Preliminary Report on a New
Syndrome. *Am J P S* 1945; 54.

The authors report on 3 patients whose clinical and roentgenological findings seem to constitute a new syndrome in the pathophysiology of infants. The syndrome occurs during the early part of the first year with tender swellings in one or more sites—usually the face and the scapular regions and the extremities—and multiple cutaneous hypersthesia; the lesions adjacent to the tender swellings and also on the ribs have the overlying soft tissues may preferentially normal. One of the authors has described a similar case of this syndrome in the *Journal of Radiology* and *Thyroid* (1939) 12: 637-655.

42. 037 0557
The maternal and bacterial flora of the
patients were essentially normal. All bacterial
procedures included growth, all tests for
qualitative studies of the blood, serum,
a bic acid agar, nitrate test, flocculation
blood cultures, rifampin sensitivity, bacteriophage
sensitivity, and hemagglutination. Bacteria
affected by eschwerlii, hypoglycemia, and
cortical bone marrow, taken from the
soft tissue. Therogenologically, the
extensive check of the cortical bone with
latency, metastases.

The a th rs notel that n the l t t r s
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case

The 13 re ti l d ag mu t incl)))
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 t e n t s D H L T H L M D

Vi	teos López V	Idl	patl	Sollitary	Bon	Cyat
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t	nos ese ci)	Fr			mal
ori	p	945	91			

It connects with 3 cases of its own the author
 causes the question of idiopathic solitary bone
 cyst. The cause of the condition is not clear
 fibrous osteolysis. There are considerable
 but as has been noted in his personal
 practice in the years (1911-1912) ten cases of
 he thinks that many cases of
 bilateral diagnosis in the present series
 generally appear as giant cell growth
 of thirteen cases. Of these twelve cases
 fifth member was a female and the other
 five were female. The one who had a cyst of a
 phalanx of the fifth toe was the only one

Th femur is the bone most frequently affected. It appears as a cavity in the largest bone and thus the extent limits the thickness of the bone. It occurs in the metaphysis but is situated within the diaphysis with a central extension from the neck to the end of the shaft. The nature of the condition depends on the extent of the involvement. In the metaphysis it occurs in the form of a cavity or a thin layer of bone until the epiphyseal line is reached. In the diaphysis it occurs in the form of a cavity or a thin layer of bone until the epiphyseal line is reached. In the epiphysis it occurs in the form of a cavity or a thin layer of bone until the epiphyseal line is reached. In the epiphysis it occurs in the form of a cavity or a thin layer of bone until the epiphyseal line is reached.

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 Th tr tm t m l pl tr ph n l
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C et t t m sh l n r ; r t l m
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 lt f th f n t g n a f n th f
 A r C M M D

Col B I d St wart F W Bon S reuma l
l l ostotic Fibro Dy pl l l S f 194

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[illegible]

If the condition of the distal end of the ulna is indicated a medial angulation of the ulna is made to expose the distal end of the ulna subperiosteally. The distal end of the ulna is completely and carefully dissected

The peritrophic membrane is completely and transiently secreted by the midgut epithelium. The peritrophic membrane is composed of a thin layer of chitin and a thicker layer of protein. The peritrophic membrane is secreted by the midgut epithelium and is located in the midgut lumen. The peritrophic membrane is secreted by the midgut epithelium and is located in the midgut lumen. The peritrophic membrane is secreted by the midgut epithelium and is located in the midgut lumen.

2. Malu n n with rad lsh rt ning and broadening of the wrist associated with prominence of the ulnar head were treated by the Campbell plastron (Osteotomy of the radius as performed at the old fracture site and a resected blade port of the ulnar head as utilized as a graft to maintain reduction of the fracture).

3. Secondary firmity was tested by using an autograph or hmgc. A trained ill subject was

4. Only grafts with stall mats were used to hold them in position while they dried a few days.

5 Arthrodesis When it appears that a satisfactory mobile wrist cannot be obtained with fusion is the logical solution to the problem.

6. Section of the distal end of the ulna. When the cause of disability and arrangement of the (radial) joint is simple, the procedure goes as follows: result is good. If distal is disabled, respect the distal end of the ulna, trans-

able to respect the distal diaphysis of the trape-
zoid base and the distal end of the scaphoid.
The distal radius and ulna are well aligned.
The distal radius and ulna are well aligned.
The distal radius and ulna are well aligned.
The distal radius and ulna are well aligned.

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J 5 1 045 3 4 4

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f g r w a t n l f t c l n a l a t f m l
f p l t b e l t h t t t h s t y p e f p o c e
c a n b e c a r l t t h f t n l f e s l t f
o r o t h t f l l g h g h p t t n

The cold was a dry, clinging
fine in which all bodily functions
for long, and half the members lost

Th th d ca e was on n whch njury to th
metacarpals f th l f h l a ca e lly a hll
f gment Th pat nt was n ght lly aft r
njury f the k hle was he l l unker fl ter
N n un on f th r e metacarpal a fr nt A
t lpl bo e graft w p e fo med t g n n fl
lowed th bon grafting Sc al roentg n graphs
ll st ated the c rse n ths ca e

It is believed that chemotherapy and caustic per-
vasion have resulted in a higher percentage of survival
for the hand in this type of cases when compared with
more traditional structures have been

Rich & J B TT J M D

Mag rt G E Arthritis of the Hip J Am M
A 945 55

A 2-stage arthrodesis was performed in the affected hip joint of 12 patients with unilateral degenerative arthritis of the hip. The patients were between fifty and sixty-five years of age. The postoperative course was followed for one to five years. The hip joint was exposed by an anterior incision. By subperiosteal reflection of the femoral capsule laterally the external acetabulum and division of the rectum cleavage line was exposed. The capsule incised and the head of the femur was dislocated. The femoral head was fixed from its cartilage with a Murphy type of cup-mer Exostosis wrench. It was fixed to the proximal end of the femur. A narrow channel was drilled into the head of the femur with a 1/16 inch bit. Small bone chips were placed on the articular surface of the head of the femur. A shaped chisel was driven vertically into the articular surface of the femur. The acetabulum was then covered with a layer of bone. The head of the femur was then replaced and the wound closed. A negative hip cast was applied.

[illegible]

Arthrodesis (fibrotyl) into tubes so
d to be the best time to take it on

rat e arthritis of th h j t Th results h-
ts dh arth pl t chr m u lumbra es
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ie bel r t tract plat r cat imm blizat
jh cal th j b ght nl t mpo r l f
Gro el l e r MD

Rand H G C. Ewalt J R and Blair H P chia
tri Reacti n t Ampu tion J t m M f
94 5 639

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j r s a d h l j u m n t t r i g e a t r a m
p o r t a n c e t o h f t s f u l e s l e c m f r t t a
n v s e n s a t i n t h a t c m t o m f r o m h i m
m m b e r

Th m s t s t r i k n f a t u r e f t h r e n t s t u d
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A n n e s e d r l i s u f e a l m m o t i m r
f r j t i t h b i t l c a u a l t
K e r l M o r e o m M D

FRACTURES AND DISLOCATIONS

Fu t n R v n d l e e R W H l l g t i m e t
F r a c t u r e s f t h e S i f t f t h e T i b i a d f m
J F S s 45 30

L i t t b o o k s b m n a u t h o r e t n d t u n t t t
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F h b l o o d p l l y t h e m o s t i m p o r t a n t f c t f
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r s k e e c u t n f t h p a t n t f r m t h
h o s p t l l f r a l l c a s e s t e j n l f
e s f l a f m m b l z a t g j a l
l w t b e r i n g a d l e e f m c h c l
t h h l l e r a g f

W h t h f r a c t w e c m m t i l t r
n h l j p l m p e a d t h t

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haling time although th commuted and c m
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m form of calcium therapy during th r fractu
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In the nstruct n to pati nts a l st d nt du
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(Haynes) l n d l th e r th rs f l th t th
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l g m nt cou l be mainta n d e n t th pen
salo of l ngth of a m ch as j nch

Se cal chart f th h l g p e of a p s t i
R EXT L M TOOM MD

F l th M S T l U f S l f n mid In Com
po d Fractu J R S g 945 7 45

T oser e of ca es f c mpo d fractures e pre
nted In e serie treated from 1933 t 194 n
local r systemic drug s sel l n th s c d
treated fr m 1941 to 1943 o e of the s l f an l es
was used locally an l in 3 case it wa g en b
r th post perati ly

O e hund e l a l s i s t y s i compound fract s
f the l o g bones we e c l d l th s r s Th y
er tr at l by primary utu e f l l w n d br l
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D : H L n L MD

ORTHOPEDICS IN GENERAL

Arestl D: Th Treatm t f R l k t with Singl
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1945 45

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Du g l N R l k t In l e e l n d l e J f v s

In sur y y f s y c h l i f e l l l l b e t w
the e s f three s o th a l t o r s l a l

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

331 A. III. Dissecting Aortic Aneurysm Involving the Renal Artery and Simulating Acute Nephritis. J. C. & B. 1945 53 33

Clinical symptoms may be produced by a retroperitoneal aneurysm. For example, hematuria may be caused by the rupture of the mbo- c t p e n c p r p u a m l g n t h p e r t a s o f e e t o m n o n u c l o s a f d t i g r t c a n e u r y s m . It is well known that a retroperitoneal aneurysm may give rise to a variety of symptoms but the acute and chronic symptoms result from the distending of the retroperitoneal artery. The symptoms are not as well known.

Lauren, C. reported that in the last 10 years the name of "Morgagni's" in the eighth century, the first author of the report of a case of this type at the St. George's Hospital. It has been reported in the literature and 60 of these were diagnosed clinically before autopsy. Recently this diagnosis has been made more difficult as the condition has become better known.

Some W. in 1936 diagnosed a dissecting aortic aneurysm in which a large left kidney infarct was produced. Rogers in 1938 reported 3 cases of which in 1 of the renal arteries. Her diagnosis was suspected from the clinical history (dilatation of the middle chest and abdominal pain in the lower chest). When hematuria developed it was believed that the renal arteries had been involved. St. George's Hospital reported a dissecting aneurysm of the thoracic aorta, the large renal artery in the left iliac fossa, and the nephritic syndrome.

Peers in 1936 reported 5 cases of dissecting aortic aneurysm in which a large left kidney infarct was produced. Rogers in 1938 reported 3 cases of which in 1 of the renal arteries. Her diagnosis was suspected from the clinical history (dilatation of the middle chest and abdominal pain in the lower chest). When hematuria developed it was believed that the renal arteries had been involved. St. George's Hospital reported a dissecting aneurysm of the thoracic aorta, the large renal artery in the left iliac fossa, and the nephritic syndrome.

Buckle in 1930 reported a dissecting aortic aneurysm in which a large left kidney infarct was produced. Rogers in 1938 reported 3 cases of which in 1 of the renal arteries. Her diagnosis was suspected from the clinical history (dilatation of the middle chest and abdominal pain in the lower chest). When hematuria developed it was believed that the renal arteries had been involved. St. George's Hospital reported a dissecting aneurysm of the thoracic aorta, the large renal artery in the left iliac fossa, and the nephritic syndrome.

Leitch, Halpern and Uhl all reported cases of dissecting aortic aneurysm masquerading as primary renal calculi. These at least 10 cases have been reported in which hematuria and the urinary symptoms were an important feature of the clinical picture produced by distending of the retroperitoneal artery. The diagnosis was clinically difficult although the retroperitoneal aneurysm was diagnosed.

The authors then present 2 cases of dissecting aortic aneurysm of the renal arteries. The first was a 45-year-old man who grew with a systolic blood pressure of 140/90 mm Hg. He had been ill for 10 years. On October 2, 1944, the patient developed a severe back pain in the right costovertebral angle which radiated down the spine and medially to the distal femur. The pain was accompanied by a feeling of fullness in the chest. The patient had no previous history of hypertension and was in good health. The pain was accompanied by a feeling of fullness in the chest. The patient had no previous history of hypertension and was in good health. The pain was accompanied by a feeling of fullness in the chest. The patient had no previous history of hypertension and was in good health.

The patient died on October 10, 1944. At autopsy, a dissecting aortic aneurysm was found involving the thoracic aorta and extending down the spine. The aneurysm was found to be a dissecting aortic aneurysm of the thoracic aorta. The patient had no previous history of hypertension and was in good health. The pain was accompanied by a feeling of fullness in the chest. The patient had no previous history of hypertension and was in good health.

The second case was diagnosed as a dissecting aortic aneurysm. The patient was a 45-year-old man who grew with a systolic blood pressure of 140/90 mm Hg. He had been ill for 10 years. On October 2, 1944, the patient developed a severe back pain in the right costovertebral angle which radiated down the spine and medially to the distal femur. The pain was accompanied by a feeling of fullness in the chest. The patient had no previous history of hypertension and was in good health. The pain was accompanied by a feeling of fullness in the chest. The patient had no previous history of hypertension and was in good health.

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 c u l t u s h a h a m a d e t i a t t e d r g t h
 p r e e s i n g f l a m l d e l t h e n t a m n a t
 I t w a f r m l y n d d p o s s i b l f m a l a r
 b e t r a n s m i t t d t o g h the m d m f l a m a f
 e s t g a t r s t h u s n l d h a v e d m t a t e d t
 f l l n g t h p r o c e s g f p l m t t h l q
 o d d f r m the w s n l k l h o o d f r n
 m f t h m a l a r n a l p a t e A n a n d d f r
 c a t t h u n the p a t f i s t e n y a r s p r o s p e c t
 d r s t h a b i s t r f m a l a u h b e r c t

S p h l A m p l o f e r y d o n r b l o o d g
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 h a d b e t r a n s m i t t i n g h g l m a t r n f
 Th p o s b i l t f j n l o c c u i g n t f s
 m t h s f l l g t h a d m i n i s t r a t n f l a m t

that if these changes leads to perhaps the conclusion that the degenerative phenomena in the thymic medulla are responsible for death and not the systemic diseases which may exist in conjunction.

Acute inflammation of the thymus is so common in infectious diseases as to be almost a rule and it may occur rapidly from infection but is not so common with a characteristic microscopical picture. The Hassall bodies liquefy and the granular degeneration and the alveolar structure is a granular bleed appear. Some cases are on record of acute inflammation of the thymic gland the degeneration of the Hassall bodies which the reaction is not a current disease or absorption in the previous x-ray therapy, electrical shock hemorrhage or other background of disease or physical or chemical changes to which this involutary could be attributed. Cases of hyperinflation of the thymus may be classified in four groups those due to physical effects such as burns shock x-ray therapy and freezing in the following virus or bacterial diseases malnutrition and idiopathic hyperinflation in 5 cases are presented in which all of the patients died of a primary disease condition associated with the thymus the lymphatic system and the shed the hyperinflation of the thymus consistently in children in a poor state of nutrition.

It is the author's opinion that correlation between the lesions would be far more common if it were looked for. If present in cases of 3 pairs of lesions of the first pair the diagnosis was made clinically and

after x-ray therapy both children died. In the second pair diagnosis was also made but a child died subsequent to therapeutic x-ray treatments. Of the third pair (twins) both died of suffocation almost at the same time and the diagnosis of an enlarged thymus in each was made at autopsy.

In the autopsies of the three cases no clinical evidences of precocious puberty were located. The enlarged thymic glands of the third pair had glands of the thymus with adrenal glands.

Sudden death in children resolves into many components and the course of one case is strikingly enough. Large amount of thymic gland lymphatic system hypoplasia and smaller related and the causes of death and disease have been through the disturbance by a tumor in the mediastinum which are based more on precedent and fashion than on observation. The new popular attention that the case is such that as a tumor in the mediastinum and that the enlarged thymic gland is the cause of the case. The physical by the examination of the lungs can be interpreted. The thymic gland is that the primary procedure in the treatment of the cases is the physical factor that these cases will in the natural evolution of the thymic gland in the enlarged thymic gland lymphatic adrenal hypoplasia and such cases are the related and as the adenitis of the thymic glands and the cases of death.

K. F. K. B. B. O. W. M. D.

SURGICAL TECHNIQUE

WAR SURGERY

HILL I G W and Cu t A I Pr t i n f Sea
sick ss in A uilt Craft I f M J 1945

Experiment on the p r e c t i o n of a sick es
r carr out in th l p c s during the t a n n g
f t o o p s n d r c o n d i t i o n c l o c l y a g g r x m a t i n g
those f b a t t l B i t i s h (r 6 6) a n d I n a r (3 6 3)
t r o o p s r e u e d f o r t e s t s

I a l l e x p e r i m e n t v o m i t b a g s s e t b i c u t
a n i c h e w n g r m w e s u e d t o a l l m e n t a k i g g t t
a n i m e n v r e a l l o w e d t o s t a n d u p i n t h e c r a f t i f t h e y
s J e s i r d

A a l t c r a f t o f v a r i o u s t p e (L C A s L C M
L C T s L C I L s) v r u e l f r l l b u t a f v
f i m e n t a d i n t h e s i o t n t h s r e m
f l e d

I n a l l p e r m e n t c a t r l g r p r e i n g n t
f l l e o b s e r l n l c o l t f t e l t
t h o s f t h e t e s t g r u p s L a l l s e a c h f t h e
t r a n d t e s t g p s c o m p r i e l a g g r m a t h o o
m n

The drug test l a d t h n u m b e r o f b s e r v a t n
e a c h w r h y o s c n e (9 9 0) h y s c i p l y m
f h e t m i n (6 2 5) h y c i n e p l u e r g t a m n e (1 6)
c h l b u t l (6 1 0) a n i e r g t m n e (1 1 6)

A l t r t h e r e j e c t n o f 2 t o o b s e r v a t i n r n d r l
v l u e s b y c a l m s e a 3 6 3 8 r m n d f r a n a l y s
T h v a l d t y o f t h e r e s u l t s h s b e t a t i c a l l y
a s e e l A h i g h l g e c f r e l i b l i v a s l v n f r
t h f h y o c n e h o s c i n e p l u s a m p h e t m e a l
n m e c h l o r b u t l e p e r m e n t s

O t h r m d s t e d t e h y o s c n e (/ o o g) p d
m i x t e f f c t i e a n i f o u f f t h f t h s u c e p t i b l m n
e t e p r t e c t e d I l d e g r e e o f p t c t n w a b
s e r v e i n r e l a t i c l y c a l m s a s h n t h s c k n e s t
c n t r l a s 1 6 p e r c e n t

N o c a e o f h e a t t r k e r t h t e x h s t i o n o c c u r d
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a g a m m u m a n i m n u m t e m p e t u l
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r a g e t f i v e h m i f t f 8 0 p e r c e n t C n l
t h c a l e c t n w a p u t f o r t h b y 8 0 f t h
t t l m n o n l t x e s a f u r t h r 4 2 4 m
c a r o f t c r y t e u a l t d n g n e
c t i h c h f t a l c a f h a t t k l c a
f h a t e h t n c e u r l m n g 5 0 0 0 n e t t
t o m

T h c o n j t n s o f t h e t e s t s c l a t l
a n i m p a i m n t f m l t r v f f n e v D w e s
l d e r f t c o o p s a g n r a l B p e
m n t i n u r t d l l t r e t d g p s O l
a o c c a (l t h e s v o l i g t h m
a) w t h p o s s i t t h a t c o m p n m g h t
h a r e b e e n d e s l f f c t d t h o s e I c u
t e a c c e r s d l t t t b t h r e c m n g s f t h
t o p e d a n g e c i e t t h f t f a n f r u g
J W F K r r r c k M D

W k l y C P G f f e c t f U n d e r w a t t p l o s i n
n t l l l u m a n f l o d L a n c e t l d o 4 5 4 8
5

The t l r c o u l t g s u g e o n t o t h e R o y a l
N a t i o n a l s e n e i d b l e d t i l t h p h y s i c a l
p r i n c i p l e s f a i r a n d u n d e r a t e f f e c t s o f e x
p l o n l l e t a k e s i n t a c c u n t t h e e f f e c t s o f l p h
b o t t o m a n d s u r f c e r s e c t i o n s o f t h e p l o s i n a n d t h
m v e m e n t f w a t e r p a r t i c l e s a t i n t e r f a c e s

T h l n t d i s t u r b a n c e a p p e a r i n g a b o e t h e
s u r f c e f t h w a t e r a s a d o o r p l u m e J a
l t t l b e a r n g n t h d a m g r s l n g t o p e r s o n n l
i n t h e t e r T h e f f e c t a r t h r e e

1 S o l i d t i s s u e c o m p l i l l i m m e r s l a s a n a r m
o r l g l l b e h a e l i k e a t r t h e p e s r p l
t r a l n g s t r a i g t t h o g h a n l c a i n g u n f o r m
c m p r e s s i o n f l l t h e i s u e s T h r l t m v l o
c m p r n f t h e n l l c l c a u s e p a i n r
i l u n t a r y m m n t l l r u i n g p o s s i l l t
n l k l l n e i t s l f f i c u l t t f u r s t a l l e l l
f m e t r n l g r

I t h c a e f a p t a l l i m e r s l n n b e
t h r m r l e g r c e i e s u n g l y v r b e c a f
t h e t c t n f p r e s a t h t h s u r f c e w h i c h
l t n a g r e a t e n l c y t r u j u t f t h e c l l
t h u p w a l p u h g t s e s

3 T h m o s t i m p o r t a t f i c t s b s e r v e d w h n
t h b o l i m m e r s l n w t r l b e c a e f t h e a r
c o n t a i n g i c e r a t h t h e r a l f a b d o m a l
a t i e s t h p r e s s u r e l l e f f e c t s f m t h e a
t e u l a c a t e n i n p l w i t h r e s l a n t
t n i n t h t i n l g u t t h t f c t n a t
t h a w t r u r f c I n t h l i t t e r c a p a r t i c l e f
t r o o f t f r r a 3 0 0 p n d c h a r g a n l a a
f m t h e u f c e l l p l c e d a q u a t e r f a n i c h

T h b e e d c t l w a r c a u a l t i e s f r m b l a t
n j t r s t h e w a t e r r a r e a s w u l l b e p e d o n t h
t h e o t a l b a i e p l n l M o s t o f t h e i n j u r i e s a r
t b d m n l c e r a T h e s e v a r y f r o m r e t p e r
t a l n l s u b p e r i t a l h e m r t h g e t p e f r a
t f t h g t t h e l a t t e r o c c u r f r e q u e n t l y
t h e t r m n a l i m l e c u r i n t h n t i m e s e n t e c
p o t a n d l a t e l l b e t w e t h t n e c f t l
l n

I t e c t i e m s u c e s r t m r f l t o n t h
b a k t p r e v n t m c h d m g f r m t n n w a v e s
f r o b l e B e s t f r a r a r o r c o r k l i f e p
f r o b l e w r r f o m t n e c k t o t h t h p o
O f n e s t t h b e r a t n t h a t a m a n w i t h a l f
f r e e r v e e r g l t h c h e s t l l s f r g r a
m a g t h a w h w r s n n t a l l

J A Y P P F l a t t e r M D

W t J P C l e s t W o u d I n B t t l e C a u a l t i e s
A S u r g 9 4 5 1 7 3 5

A l m e t e l e p e c l s e d t h t t m t f
5 p a t i e n t s w t h w n f t h c a r a t y p e
m t a t h f l w s g g e n t a

J. L. M. R. J. Operati on for An t. Fi tulas.
Som Reaso f r Filures f e J s f 94
68 323

A r w of the recor s f 500 pat s wh cam t the Mayo Clinic beca of n a t t ul or more pecitically dra g s us n the pen nal anal or re tal rem n d closed that 43 per cent or n a l half of them prev u l h d u d rgon from 1 to 4 operati ns that had be n u uccesful

The most freq ent ca ses f th fa l re of opera tion to rad cat an anal fistul a e as follows (1) faulty concept on f the o m and c ure f th disease (2) confus on in rega d to the an tomy (3) confusi n in rega d t the t m ology (4) mis tak n diagno is (5) f r f causi g rectal cont nence (6) adequ t post perati e care (7) fa lure to appreciat the d ng r f performi g an rectal perati ns n the pres nce of infectious diarrhea (8) dequ t n sthesia and (9) lack of te chi g f c l t es in m d cal hools

ANTISEPTIC SURGERY TREATMENT OF WOUNDS AND INFECTIONS

Lam G. R. a d Puppnd hl M. The Pyruvic Acid M thod f B m Sl gh R moval A
S f 945 866

Th e is general agreement that the pr cess of r pair n any type of wound s fa ored by the ea ly and compl t emo al f no ble t sue. Thus d bnd m t a e m pl hed m cha cally in the contus d lacerat n. Alth ough s ch u g cal tre t m t has been p oled to burn occasionally t has be n assumed that a h m cal m thod of sl gh r m al would be pr f sahl becau of the d ficulty n m l n an early and accurate determ nation of th a e s wh ch will f m at ly pr ve to be f th rd d gr e i d pth

In xperim t l d s a ly slo gh g was p o d ced by dress th small th rd d rce burns w th pyru c c u n sta ch p te plain s p e c t sta ch pa t trag canth jelly and cotton wet w th d sti led water. Th nly common f c t r s the d s u g s was th wetness

It s gested that the fa rable f f c t n slough i bt i ed w th pyru c id pa te due more to macerat n than to the cid r t n produced bout th ound d drs gangren s thus con e ted nt t n
SAMUEL KAHN, M D

M. Intosh J. R. bi son R. H. M. Selbi F. R. R. ldy J. P. and Others. Acridin Sulfona mide Compound as Wound Anti ptics. Clin ical Tr l f Flavazol. La d Lo d. 945 49
0

Res rches ha dem n rated that a wid a t v of bact ria con t t the Lora f infect d wounds nd al that gram negat e bacilli a d colif rm nd p ot s bacilli r primary in ad rs of battle and c l ian w o n as sten the gram positi e cocci. Whil the gram gat bacilli are n t o h gh l pathogen e as th p g e cocci they fit n

e l l a l a l g a n l n c t m e r e
t r C t m e t h a p e u c t l a c e s a p p l t
me h t rest te n the r n g of
ct An e f f c i e n t n t r e p i c f l a c a l a p p l c a t n
h u l l p e n t or co t r o l i n f c t n b l l t h e
o s g a n m. l e n c i l l i n f c t i m a n l a g a n t
the p e n i c c o c c i and e r t a n c l e s t r a w h r a s
the gram negat bacill a i e r e t e p e n i c i l l a
a d l t n e r n d e s t r o y T h s u l f n a m d a e
l k e w e m e w h a t r e s t r i c t e d t h i r r a n g e b t a e
p a r t i c u l a r l y f c t i e l a n b g s r e r s t r i p t o
c o c c a l i n f c t i o n s

The acridine ant ptics such a p o l a y n e e v e r y a c t i v e a g a n t b o t h p g n c o c c i and gram negat e bacilli. Accord ng l the uth rs gave the acrid nes a tho gh trial n s p i t e of their pos sible irritant e f f c t on the t s u e s. They diluted p o t a v n w th sulfathiaz l thus provid ng a p o d e r wh ch co e d c o m p l e t e l y t h r a n g e of bacteria l k e l y t b e f u n d i n a n y w o u n d o t h a t a n e g i c a c t n e u l d b e b t a n e d. The m i x t u r e s p a r t c l p r o f l a u e t 99 p a r t s of s l f t h z l wh ch can be a f f i n e d i n l l t y p e s of w u n d s a n d h s p o d f g r e a t a l u e w h e n s e d a g a i n s t p y g c r g a n m b o t h t h g r a m p o s i t c o c c i and the g r m n g t bacill d d g t h p o t e n s bacill a d d p e r h a p s to a l e s s e x t t h e p s d o m o n a s p i c i a n. Th a p p l c a t o n of t h i m i x t u r e a l s o a l p m a r y s u t u r e i n p o t e n t i a l l y i n f e c t e d w o u n d s n i n j u r i e s. Th u p o d m t u e i s n o w b e i g l i v u l i n t h E g l i s h A m y a n d i n d u s t r y b e g a p p l e d t w h s a f i r s t a i d m e a s u r e

A f r e t h a d a n c w a s r e c e n t l y m a d i n the acrid s e s f d r u g s. A n t y p e of ac d n e c o m p o u n d n a t i n g f a c h e m l c m b i n a t i n of a n i d i n n d u l f n a m d w a s i t r o l e d. Th n w c m p o n d h a s p o i d d a n w s r i e s of bacter i o s t a t i c a l l y a c t i v e d r u g s w h c h a t n e u t r l e r i g h t l y l k l n n s f t o n a n d a r e l e s s i r r i t a n t t h a n t h e c r i n c o m p o n e n t s

Flavazole a c o m b i n a t i o n of p o f v i n e n d s u l f t h a z l w s h o s n f o t h a p e u t i c m i s. Th s p o w d r m t r c a n b e e n h a n c d i n s a c t i v p a r t i c u l a r l y a g n s t a p h y l o c o c c b y t h a d d i t i o n of p e c i l n w h i c h i s f l y a c t i v e t h e p e n u f f l a z e i n a s o l u t i o n of a b o u t t o 3 0 0 0 f a z o l c a n b e u e d a n a n t i s p t e y e w a s h w i t h o t c a u s i n g i r r i t a t i o n. Th i s s o l u t i o n h a s L o p e r d f l i n d s a f f t h i r r i g a t of i n f e c t e d w o n s a n d i n b l a d d l a g e. F l a v a z l e s a l o w l l t l r t d b y m o u t h

An t h e r m m b e f t h s e r i e s t h a t c l d b e u d i s a s a m p s e n d e s f l a t h a z o l e m m n d w h c h i s p r c t i c a l l y a s a c t i v e a s f a z l i n d h a s t h a d a n t a g f b e g a l m o s t c o l o r l e s h a s l i g h t l y s l o w t n g e. I t i s l i g h t l y r r i s t a t g n i l e c o l u b l e t h a n f l a z o l e

I n n t e s t s t o d e t e r m i n t h c m p t i v b a c t n o s t a t i p o w r s f t h e s c m p o i s f l a v a z o l s u l f a t h a z a n d p r f l a v u w r m a d e. T e s t s h o w t h a t t h e n e w c o m p o u n d s l o s t e f f e c t o f t h e b a c t m o s t t e p o w r s of t h r c o m m o n t s i n t h e c a

the proflavine isoflathiazole compound (flazazole) it was found that it has slightly more activity particularly against gram negative bacilli.

In general, sugar tests with sulfathiazole powder were carried out and proved equally satisfactory. Clinical trials have demonstrated that sulfathiazole can be used safely as a solution in the conjunctival sac and in any infected cavity as a wound antiseptic. For clinical use in the local treatment of wounds, the authors have recommended a powder mixture containing 2 parts of sulfathiazole and 98 parts of sulfathiazole. The proportion of sulfathiazole can be increased to 5 per cent in the treatment of old suppurating wounds.

The present report concerns itself mostly with the carrier out in the distal and spinal unit of the Stoke Newington Hospital where the cases were mainly open wounds which could be accurately observed clinically and bacteriologically.

The case s tre t d in the pl s c unt w re mostl
old infected wou ds f om weeks o e n n nths
duration o whi aris us f r m t treatm nt and
ant septic s had been u l witho t satisfact ry re-
sults As most f the w u s were large pen ones
la l to seco dari flecti n th y p esented a e r
ch lling to th s cl cal tri l It is int est ng t
note th t in 50 p cent f the ca es the organisms
d appear l th n thr days and in a fu th r 25
per cent they we e l m d at d w th n the next four
days Operati e proceed s we e the fore pos sible
un s all rl The s cess of the t atme t was
est mated by the take of skin grafts o le l g after
var o spl stic operati s The l cal es sm nt
bears a clse r lationsh p to the bact ri l g cal
find ngs in that complet success was attained in 5
per cent of the ca es and in the ther 5 pe cent the
infecting o g n sms di ppe ed within three da s
Si ce most of the ca es in which th fl azol powd r
m t was d w r t a lly inf ct d f r a l ng
pe d th c es n which th was little h pe
f clea ing th nf t n w th methods hith r m-
ployed In most ca es th b y ct wa to get large
gr nul ti g a eas eff ctly free from infect n to
warra t k gr ft g The s of fl azol has
mat ally sh rt d the tim f ct r i clea ring p
inf ct n lts u d es t m t m t t aginst
the take f kn graft lth gh cry perat n
ther e i ent t w th g ft ed f res l
traces f tl drug n l c mpre es w r p-
pled named l l belf r th g fts w appl d
In the p f th a th r f le lth gh t
uni ers ll cces f l con t t tes th most f fca
c u fscal applcat n again t m d ct n l
blea th n es nt

ital processes were unable to assist in the destruction of bacteria in the infected areas because of the inability of the co-infection which existed. Nevertheless, 50 per cent of the cases were resolved relatively free of bacteria. Here again it was noted that in nearly 50 per cent of the wounds the infecting organisms were eliminated within three days. There was however, a greater tendency toward relapse and secondary infection, and the clinical results were not so good as in the plastic unit. Nevertheless, in spite of the difficulty in completely eliminating infection in these devitalized tissue infections, wounds so reduced to healing were favored.

In a powder mixture 2 per cent flavazone is active as 1 per cent of proflavine. Because of the greater activity of flavazone against gram-negative bacilli its nonirritating properties and its great margin of safety it should be more widely used as a wound antiseptic. The mixture of flavazone (2 per cent) and sulfathiazole (98 per cent) when used as diluent for penicillin provides a highly potent antibiotic preparation with a wide range of activity against all bacteria likely to be found in wounds.

M. THOMAS STEPHEN, M.D.

M THOMAS J SEEVERT M D

M f lane M G Fatality of G Gangrene in
Relation to Treatment. *Ed M J* 1945 803

In the series of 185 cases of gas gangrene, the Central Mediterranean Forces reported the case fatality rate has been examined in relation to the treatment given. The combined method of treatment with surgical measures, intravenous antibiotics and bacteriostatic drugs when given as recommended was highly effective in reducing the death rate in cases with gas gangrene of the leg or arm. The death rate in cases of gangrene of the thigh, buttock or abdominal region was approximately 40 per cent in spite of the treatment even among those who received penicillin systemically.

The finding suggest that the specific treatment is generally effective in controlling the individual infection but that in cases in which surgical excision of the affected tissue is limited in extent, some factor associated with the local damage to the skin may contribute to the severity of the disease.

BENJAMIN GOLDMAN M.D.

BENJAMIN GOLDEN M.D.

Spott. S D and Da J J fl All nt in Sulf nlla
mid Ol tm nt in S rē ry (w J S t 1945
60 4

has to be cut. An 18 gauge needle is used and the amount of opaque material injected usually varies between 1 and 15 c.c.

The x-ray procedure is quite simple. The authors prefer stable well-calibrated heavy-duty equipment rather than lightweight apparatus which can be wheeled into the operating room. For exact positioning and duplication of particular projections they use a bread table of the type described at the University of Chicago. Split second exposures are not as satisfactory as exposures up to 15 seconds but not longer.

The contrast which is 25 per cent thorium dioxide colloidal suspension was found to be the best contrast medium in deep tissues under the property of long half-life radiactivity. There has been no fatality in the series attributable to the procedure. In 3 per cent of the cases there is untoward effects such as transient hemiparesis, hemiparesis, aphasia, and convulsions. Manifestations were noted. Complications are extreme arterial hypertension, advanced arteriosclerosis and hemorrhage, and thrombosis or embolism of the cerebral vessels.

Intracranial angiography should be used with discretion after preliminary localization of the lesion. The carotid injection serves a good purpose in the supratentorial lesions whereas the vertebral injection is of greater value in the lesions in the posterior fossa. T. LEVITSKY, MD

J. H. L. Evaluation of Roentgen Therapy in Filariasis. *Am J Roent* 945 53 453.

Filariasis in the present military conflict has become a disease that has challenged the ingenuity of the doctor. The author evaluates the results of roentgen therapy in a group of patients afflicted with filariasis with the entire group of patients who were not treated with roentgen therapy.

From seven to nine months after arrival in the South Pacific Islands military personnel suffered to be afflicted with the disease. The disease starts as a lymphadenitis then continues as retrograde lymphangitis, cutaneous manifestations are noted. The symptoms are fever, headache, aorexia, mental sluggishness, nervousness, fatigue, biliousity, and pain in the area of lymphadenopathy. The lesions are caused by the wucherer bacillus. Positive blood smears, rare. The organism is best found in the lymph nodes. Man serves as a host and 45 patients from quaternary centers are mentioned.

The evaluation of the roentgen therapy is difficult because of sporadic remissions and exacerbations. Report the literature is too conclusively as to the value of roentgen therapy. A result two groups of patients each were selected for treatment. One was treated with radiation and the other to serve as a control group through the mechanisms of recovery. The roentgen therapy with actually received 1 gram. The control group had no knowledge of not having received therapy. The group receiving roentgen therapy had the same treatment.

given locally and in some instances whole body irradiation was used. The technique was follows: medium x-ray voltage (155 to 200 k.p.), 15 ma, 5 cm tube skin distance, 0.5 mm of copper plus 1 mm of aluminum filtration, a 10 by 15 cm field, 15 roentgens measured in air were given on alternate days for a total dose of 45 roentgens. When whole body therapy was used, 1 roentgen was given per treatment.

The results were not encouraging. In a follow-up study the results obtained in the irradiated and control groups showed no real beneficial effects noted as to frequency, duration or severity of the recurrent attacks. In some patients the size of the local glands decreased with roentgen therapy. Local roentgen therapy had more effect on the whole body irradiation. MARCHAND, S. CURRY, MD

Rosh R. and R. L. Radiological Therapy of Carcinoma of the Thyroid. *Radiology* 945 41 559.

The authors publish a series of 64 cases of carcinoma of the thyroid gland; the Radiological Therapy Department of Bellevue Hospital, New York. The results of 93 cases in the series included the large thyroid centers such as the Lahey Clinic, the Cleveland Clinic and the Mayo Clinic. They were for the most part far advanced cases which reflect on the final results.

In connection with this series of cases the authors discuss the following aspects of carcinoma of the thyroid: incidence, pathology, metastases, clinical picture, differential diagnosis, treatment and prognosis.

A study of the incidence would suggest that the incidence of the thyroid gland is on the increase but this is more apparent than real as to the advances in clinical and pathological diagnosis. The proportion of thyroid cancer has been estimated from 1 to 5 per cent. According to Haddad, the incidence of thyroid cancer is 0.06 per cent of all carcinoma deaths in the United States. The age incidence varies widely, cases have been observed in early childhood and patients in their sixties. The average age is about fifty years. There are few cases among females than among males but the proportionate.

The histological classification is based on the malignancy of the tumor. The simplest is that of metastatic carcinoma of the thyroid gland. The (1) papillary carcinoma, (2) follicular carcinoma, (3) medullary carcinoma, (4) anaplastic carcinoma. The characteristics of these groups are discussed.

Metastases occur in all organs in the body. The lymphatic system is the most common site of metastasis. The next most common is the lungs. The next is the bone. The next is the liver. The next is the spleen. The next is the pancreas. The next is the stomach. The next is the small intestine. The next is the large intestine. The next is the rectum. The next is the bladder. The next is the prostate. The next is the testis. The next is the ovary. The next is the uterus. The next is the vagina. The next is the cervix. The next is the vulva. The next is the perineum. The next is the anus. The next is the rectum. The next is the sigmoid colon. The next is the cecum. The next is the appendix. The next is the gallbladder. The next is the pancreas. The next is the stomach. The next is the small intestine. The next is the large intestine. The next is the rectum. The next is the bladder. The next is the prostate. The next is the testis. The next is the ovary. The next is the uterus. The next is the vagina. The next is the cervix. The next is the vulva. The next is the perineum. The next is the anus.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Kyhos, E. D. Svinghaus E. L. and Hagedorn D.
Large Doses of Ascorbic Acid in Treatment of
Vitamin C Deficiencies. *A. J. M.* 94 75
47

The effects of large doses of synthetic ascorbic acid on urine excretion in plasma and whole blood are reported for 26 patients hospitalized for other ailments but judged also to be deficient in vitamin C. The basis of history, clinical signs and low plasma content of ascorbic acid.

If the plasma level was low single doses of from 100 to 500 mgm of ascorbic acid produced effect. Some patients received as much as 15 gm. in one day without significant urinary loss while the plasma content of it min C was increased to high normal levels. In order to produce a therapeutic effect of 4 mgm or over from 0.5 to 2.0 gm of ascorbic acid supplement was required and for saturation from 1.5 to 2.8 gm. In a few cases intravenous administration resulted in a slightly greater excretion.

The individual variation in the renal threshold for ascorbic acid apparently is wide. The probable plasma level for this varies ranged between 1 and 10 mgm per cent.

That a determination of the whole blood level is superior to that of the plasma level in the diagnosis of vitamin C deficiency was not demonstrated. Patients with low plasma levels generally excreted very small amounts of ascorbic acid, while the dosage had raised the plasma levels to 100 mgm. Age did not seem to affect the result. Clinically but variations in the results of treatment were observed. The time might be attributed to the disease is probably one factor that may influence the response to ascorbic acid treatment. In the presence of renal liverment or blood dyscrasias response was atypical.

WALTER H. VANDER, M.D.

Comroe J. H. J. Driggs R. D. Dunk, P. R. and Deming M. Oxygen Toxicity. *J. Am. M. A.* 94 8

Oxygenated percent oxygen administered a large quantity of normal men continuously for a period of two to four hours produced subnormal distress in percent of the men. The vital capacity was usually decreased. Signs of nose and throat irritation were common. Control subjects below than 100% through the apparatus did not experience these symptoms.

Interruption (p) to fifteen minutes rest every three hours did not decrease the incidence of the complaints.

Concentration percent gas produced symptoms in 15 percent of the subjects. Percent oxygen

generated no symptoms during the test period. Since oxygen tents are catheters rarely produced a large oxygen concentration higher than 50 percent these findings of administering a gas are completely safe.

Breathing of 100 percent oxygen at high altitudes (low total atmospheric pressure) does not produce symptoms. This indicates that the symptoms are due to high oxygen tensions and not to the elimination of nitrogen.

The use of 100 percent oxygen for short periods is probably safe in all patients but when the patient must be engaged in activities which would be obstructed by the oxygen concentration should be reduced to 60 percent unless it is sufficient to saturate the arterial blood. A 100 percent oxygen must be administered for a sufficient time to be effective. The symptoms must be allowed to occur as a result of the high tension of oxygen.

There is a change of opinion on the use of oxygen therapy. (1) to combat arterial hypoxemia to hyperoxygenate the blood in cardiac respiration. (2) to combat arterial hypoxemia in pulmonary disease and (3) to combat arterial hypoxemia in the body to produce a compensatory response to combat the test results.

With respect to the first indication that it is not safe for oxygen and estimates should be given by measurement of arterial blood oxygen tension. The changes in arterial partial pressure of oxygen of a normal blood oxygen saturation by Van Slyke method are not enough to be employed in the study. The indication of this type of oxygen therapy is the creation of a situation in the arterial blood which is not a dose of oxygen that is being given when the oxygen tension is not at its normal and the oxygen tension is reduced thus. On the other hand percent oxygen may be given with safety to the hypoxemic patients for short periods. When oxygen therapy must be continued for a two to four hour period the concentration must be decreased to 50 or 60 percent unless this is not at all properly indicated. The arterial blood when in saturation of the arterial blood is less than 100 percent of the percent oxygen from 80 to 100 percent of the blood gas concentration at a given time of the patient. If the patient is not doing the positive built-up of the oxygen tension of the oxygen. Oxygens are not necessary for the patient's safety. The rate of blood.

With respect to the condition of 100 percent oxygen therapy (hypoxemia) the blood gas tension is a factor in the clinical diagnosis. The partial pressure of oxygen in the blood is a factor in the diagnosis. The partial pressure of oxygen in the blood is a factor in the diagnosis. The partial pressure of oxygen in the blood is a factor in the diagnosis.

th pat nt every six h urs in regard to substernal d tress especially follo i g deep bre thing or re mo al f th mask if not c ntra dicated cl nally a ear f l vital capacity d termination should be mas twice da ly t d tect the appearance of pul m n r congesti n

W th respect to the thir l g oup (de itrogenation) th e is rar ly a nee lso pr long d breathing of 100 per ce nt oxygen nee nitro n is elim nated from the body within se eral hours Furth r i halation of 100 per ce toxy n to remo e ntrog n and r l e intesti n l d t tion should not be nees ary unles the pat t swallows air on remo al of the mask

CH RLES BARON M D

GENERAL BACTERIAL, PROTOZOAN AND PARASITIC INFECTIONS

Dobson L. and Cutting W. C. P icillin and Sulf namides in Acti omycosis *J Am M A* 945 128 856

The pre nt report describes 16 cases of v ous t pes i ctinomycosis—3 pulm nary 2 abdom al, and 1 of th cervicofaci l type—which were treated with s lfo am les or penicillin

D ring th la t three ears a n mber of articles d l g with th use of l f namides in th t tment f ct n mycosis ha e ppe red in th lter t r and the es general ag eem nt th t the llo n m des a e of great value The report h that not lv the cervic fci al type but al o the xten i abd mnal and p lmon ry types f acti n m cos ha been cu d or at l ast arrest d f r l ng pe od f t me f l l g the us of s l f nam les M er t s st l too early to d aw f nal co clu s a to th f facy f penicillin in the tr atm nt of acti n mycosi The ports i the lterat re h that penicillin i an f fct e g nt int a ng ct n m cos Sev r l fal t s ho r h e been ported

Th auth rs e mp th f fcti nes f penicillin d f th ulf amides the t e m e t f c t m cos and the ar g d th t nal concl s s sh l l not be drawn unt l pat nt h be n f llwed p f o peni l f n tles th ght n months Tr atm nt with l f namides an penicillin p ro d e v be fci l m t of th th rs cases which re p o t d with th idea f ncourag ingg ter of th f ugs nd ecumul ti galarg r series f cases fr m h l f f t co l may be la n

In addi ti n t th f fct f t es drugs n 16 ca f acti n vcos a e concentrat n f penicillin and l f da w be m ed f th r eff ct nd f nt t n of t n m cos tr Th 6 cases ar eported n e n t l t lw th r g r l t th cl n cal h tory i n l l t at e t Th f fct u ulf pe ce l ecal l h g the diagn of t n m cos th t f f n n s l f r gra les th p l f th 6 cases th t p cal l f r gra les f ct ces be w f n l l e th f t e o g m w lent f l act m es at es th

remaining 3 ca es th e ct species was n t f l e n t fied

Of the 16 pat nts treated 7 w re con l red cured in 7 the d case was arrested and 2 p ti nts d l Whe the dose was adequate prompt im provem t f llwed in each instance W th e cep tion f the 2 fat l ca es all of the patients r mained cured or the process was arrested for a con id rable period of time Of the 2 f l tal ca es 2 fal revealed e ten ve pulm nary invol ment an l l l sho n impr m nt with each short c rs of sulfa di z ne but treatment was not conti ed long enough on any occasion to be effect e the other ca e with ext n e lver a d pentional absces had responded to ulf thiazole and th process was arrested for se eral months after d cont nuance of the drug h we r the sh rt course g en in the termi al stage of illness wa ine ff ct

A surv y of th cervicofaci al ca es sh e l that in 9 of 11 pat nts th re had be n dent le t ction In 6 the e tract ns preceded the appe rance of the infection whereas in 3 the e tract o s w r n t done unt l a t r the f fctio had sta ted In th 2 re maining ca es pus wa f r n ng from a u d ne or mor teeth The a thors bel e that these ca es support the ndoge u the ry f f nct n which suggests that th path g n c organ m ar m re or les constantly present in the m uth an i n the al mentary canal rather than the e gen theory which suggests that the inf ct e g ms are taken i the m uth accid tally and at once pene trate int the t es M r th occupat ns and mode of l i g the pat nt with but one xceptio (a nine y e old lnd n g r l) ere not s ch th t f r quent contact with f fct e t l or th rees wa possi b One f at r mph 2 d b the thors in th study of these ca es wa that where r bonv in l m nt appe r i a l g r period f tr atm t wa nees ry

Th i o tests e rrobated th f n cal m pes n f ar n g s cept b l ty of th f r nt tra f ct m cest sulfa i n l per cill If m gm per hund ed cubic cent m trs in the bl d i e n f r d an a r g good th raput c l l f s l f ad zin d s u t per cub c cent m t high t l raput c l l for penicillin t s cl that ulf sia e th mo pet r Th g n eral co cl drawn th t les xcepti lly high co concentr n f penicillin l t l rug ppe r st be s l ght l f t l f a g r t a st of t m es n t an f f t l oth penicillin n th s l f nam l ar b l f ct drugs n th tr tm nt of ct n m cos

M m J r M D

W l l L. H ghes R R and Ra M R
St. phyllococci Dysentery Septicemia Treated
with I nicilli *I s M J* 91 6 90

Th th rs r port 2 cases f dysentery s p r e s p t e m tre ted with peni l fct Th frst w at p l e a f f ct ca t t o ph llococci f r g r m c w

and to gradually increase the time up and about until fairly normal activity was established before preparation of a balanced diet was begun with three full meals a day and lunches between meals.

Patients with heart ailments were hospitalized for from ten to fifteen days and during this time the usual measures for congestive failure were instituted including bed rest, the administration of digitalis and full and maintained digitalization. After complete saturation was restored the patient was discharged and further cooperation in treatment was carried out at home. The administration of thiouracil was begun in the third day of 0.6 gm. 0.2 gm. being given 3 times a day morning, noon and 9 p.m. The full dose was continued until the maximum benefit was obtained at this point all hyperthyroid manifestations subsided and the basal metabolism was normal.

The operative procedures are described in detail and the treatment of the associated thyroiditis is discussed. The most serious and alarming reaction was the development of leucopenia.

In conclusion the author notes that thiouracil is most valuable drug in the preoperative management of patients with severe primary hyperthyroidism and omatous goiter with secondary hyperthyroidism. The drug must be administered until the maximum benefit is obtained and at that time further treatment can be carried out with less risk. The technical difficulties at operation which occurred in patient treated previously with thiouracil have been overcome by the added use of Lugol's solution during the three week period immediately before operation.

Since thiouracil cannot be given without danger of toxicity it must be carefully observed during the preoperative period for any signs of toxicity. The blood changes are of greatest potential danger and frequent blood tests are imperative to avoid difficulty. The true value of thiouracil in hyperthyroidism lies in the reduction of the risk of surgical treatment in which it still essential in order to terminate hyperthyroidism with great certainty and greater safety.

HERBERT F. THURSTON, M.D.

McGaughey, T. H. and Dr. L. J. J. Th. Beha.
of Blood Cholesterol in Thyroid Patients
under Treatment with Thiouracil. *J. L. B. C.*
1945 3 536

Fasting blood cholesterol values above 200 mgm per 100 c.c. were obtained in 15 patients with treated thyrotoxicosis. The average mean pre-treatment basal metabolism rate for these was +43.5 per cent. Thyrotoxicosis therefore may and does occur in the presence of hypercholesterolemia. Serial examination during the treatment of 36 patients revealed a mean or less than 1% elevation of lipids between the pre-treatment level and the blood cholesterol and the falling basal metabolism rate.

In the treatment of high cholesterol blood cholesterol levels were obtained in the majority of patients whose basal metabolism rates had been elevated +1 or below. The correlation between the two is

rate was between +10 and +15. Cholesterol patients felt at their best when the basal metabolism rates lay between +5 and +10 and high normal values for blood cholesterol were present.

It is suggested that either the basal metabolism rate or the cholesterol value or a combination of the two may be used as a guide for the satisfactory management of the patient with the drug thiouracil.

S. WELLS KATZ, M.D.

Fishberg, E. H. and V. R. J. Th. Beha.
Thyroidism. *J. L. B. C.* 1945 3 95

The authors report their experience with the use of thiouracil in the treatment of 96 patients suffering from hyperthyroidism. The dosage was 3 gm daily for three days followed by 0.6 gm daily until the basal metabolism rate dropped to within normal limits. All of the patients were ambulatory.

The initial response to the drug as subjective the patients stated that they felt calm. The results indicated that the radiotherapy is sufficient for the reduction of the basal metabolism rate but it was emphasized that the danger of granulocytopenia and granulocytosis is ever present though its occurrence entails no interruption of occupation and allows the necessity of operation.

In this series only 4 patients were not benefited. These were thyrotoxic diabetics. The authors discuss the use of pyridoxine or vitamin B in prophylactic doses of 15 mgm daily by mouth with 200 mgm intravenously when necessary as a drop in the white count has taken place. B. W. W. C. 1945 3 104

H. Rathal, L. M. Souder, G. R. DePersi, J. D.
and M. Sullivan. Ten to Twenty Year Results of the Wing Subtotal Thyroidectomy for Primary Hyperthyroidism. *A. Preliminary Report*. *N. E. J. Med.* 1945 161 1016
1927 5 21

The authors state that subtotal thyroidectomy has been a durable method for the treatment of hyperthyroidism. The method of treatment for hyperthyroidism is the simplest procedure for the patient and the physician. The method of treatment is the most effective and the most beneficial to the emotional and physical health of the patient. The method of treatment is the most effective and the most beneficial to the emotional and physical health of the patient. The method of treatment is the most effective and the most beneficial to the emotional and physical health of the patient.

The authors studied 10 cases of primary hyperthyroidism. Graves disease was the most common. The patients were followed for 10 to 20 years. The results of the subtotal thyroidectomy were excellent. The patients were followed for 10 to 20 years. The results of the subtotal thyroidectomy were excellent. The patients were followed for 10 to 20 years. The results of the subtotal thyroidectomy were excellent.

Subtotal thyroidectomy prior to 1927 was not the radical procedure that it is today. A. W. W. C. 1945 3 104

patients were operated upon before the introduction of Lugol's solution as a preoperative preparation. Of the patients studied 62.1 per cent had a basal metabolic rate of over plus 50 per cent on admission to the hospital before 1917. Twenty-one per cent of the patients after 1930 had a basal metabolic rate of plus 5 or more. These findings suggest that the epi-thalamic center today even in view of the effect of iodine is not as severe as formerly.

Of the 1016 patients studied 16 died postoperatively. Three other patients died of hemorrhage or hyperthyroidism before returning for their first, second or third operation. Eight others who had persistent or recurrent hyperthyroidism did not live ten years but it was not known definitely whether the hyperthyroidism contributed to their death.

The authors state that the distinction between persistent and recurrent hyperthyroidism is difficult at times. For purposes of classification however a patient who shows persistent toxicity three months after operation has been considered to have persistent hyperthyroidism. Patients who had a normal metabolic rate at the end of three months and who showed no clinical signs of hyperthyroidism were then considered as recurrent cases if hyperthyroidism was found subsequently. Before 1917 it was the practice of the authors to prescribe 10 drops of Lugol's solution once a day for the first three postoperative months.

The relationship of the amount of thyroid tissue removed to the subsequent metabolic rate is demonstrated by the authors. If a thyroidectomy decreases the average metabolism approximately one-half at least for a period of six weeks to two months thereafter total ablation of the thyroid induces myxedema.

The basal metabolic rate obtained at three months has some bearing on the time of recurrence of hyperthyroidism especially on the low metabolic group. Those patients who had a metabolic rate of below 10 per cent developed the rate either because at the time too radical a procedure was carried out or because the activity of the thyroid tissue left behind was normal or subnormal. Thus before thyroidectomy can be considered in cases of the normal adult a great length of time will be necessary to complete clinical hyperthyroidism other things being equal. Recurrent hyperthyroidism did not develop in any of the 8 cases with a metabolic rate of 25 or below. This is not always true because occasionally individuals who have developed postoperative myxedema subsequently although not for a period extending to several years showed recurrent hyperthyroidism.

The greater percentage of recurrence of persistence occurred in patients with the highest metabolic rates. This would indicate that the following case of hyperthyroidism is persistent growth rather than the average decreased metabolic rate. It is probably does not remove the cause of the tendency to develop the recurrence greatly.

The authors state that it has been their policy to give patients with persistent or recurrent hyperthyroidism a trial of Lugol's solution if the patient severely so. This diminishes the output of the thyroid hormone and in many instances brings the metabolic rate to normal. In spite of the fact that some people continue to be thyrotoxic and then subtotal thyroidectomy is advised by the authors. In other cases iodine controlled the condition for only a variable period of time until clinical toxicity finally appeared suggesting an intensification of the underlying cause.

For those patients in whom reoperation was not considered advisable and iodine did not completely control the symptoms roentgen therapy was used. More recently thoracic has been used in recurrent or persistent cases with the exception of those not under the direct observation of the authors. Improvement in well being of the patient was noted when thoracic was substituted for the Lugol's solution.

There is a small group of individuals who continue to develop hyperthyroidism even though temporarily controlled by surgical removal of iodine or x-rays. In these it would seem necessary to produce myxedema in order to prevent a recurrence. Roentgen treatment has not been permanently successful unless at least from 12 to 18 treatments of 300 roentgens each have been used and in some instances recurrence has taken place notwithstanding patients had mild demersometric.

In conclusion the authors note that in 589 living patients followed up the results were considered excellent in 386 good 139 fair in 38 and poor in 26 to the end of the follow up.

HENRY I. THURSTON, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Atwater, J.S. and Bragg, J.A. The Pathology of the Intestinal Polyps. *Gastroenterology* 945: 4395.

A study of 241 colons at autopsy at the May Clinic during the period between October 1942 and February 1943 was made as follows:

Each colon was fixed in a modified Kaiserling's but for a few days and studied by means of a hand lens. Those which appeared to be abnormal were taken and placed in a petri dish in a special section were cut in several sections. The sections were divided into the following groups:

Those in which no abnormalities were seen the grossly normal colon called the "normal" colon.

1. Impaired control section in the adjacent intestine the polyps found in the colon.

2. Section of the colon by the adjacent tissue and malignant growth.

Any stricture protruding in abnormal form above the normal mucosa or any other related to the grossly normal colon was called a polyp. Polyps from the normal colon were called

phangi mas lipomas and oth r ben gn tum rs wer excluded. No cas s f congenital pol po s we e included. Tissues of n wborn infants and of nin ty year-old patients were included.

Polyps w re found in 69 per cent of the cas es which is a much h gh r incidence than that noted in other reports the rang being f om 2 37 to 6 per cent of all cases also the incidence of les ons seemed to be the am in both males and f males. Solitary growths occurred in 21 per cent f the cases w th mal gnant polyps mult pl growths (from 2 to 6) in 63 per cent and d seminated growths in the rema ing 16 per cent. Fifty even per cent of th m lg nant polyps and 91 per cent f the benign polyp we eses le. In th cas es with ben gn polyps the in cl nce of olitary growths was gre te.

In these stud es it was pos ble to trac the path og nesis of intes tal polyps from the earliest epit hial change to frank carcin ma and t is therefore bel eved that polyps are fo med th o gh ep th l change. The etiological factors a unknown. Lym pho d structures seem d to play nly a casu l role in the pathogenesis of intestinal polyps and occurred in f om 13 to 17 per cent of ll cas s of polyposis in this series.

The polyps presented a grad al se ies of chang s as follows

First, all of th polyps showed thick n ng of the muco a because of elongation of the crypts f L e be kuehn. Th degree of ramificati n seemed t be r lated to the degree of mal gnancy. These changes did n t extend from the mucular mucosa but occurred as branching in 6 per cent of the mal gnant polyps.

S cond the cellular character cha ged p ogres sely f m that of normal control through that of be ign to that of malignant polyps. The cells be cam more ir regular d creas d in height and grad ually became cuboidal type c lls. These cells be came piled in layers in a dis rde ly fash on and cell n clei showing mitoses becam m e f equ nt. Th cell nucleu n rmally is in positi n of close approximat n t the basal-cell m mbrane but as m e mal gnant changes occurred the n cl ar polarity was lost nd m re nucle r fo dele t d from th basement m mbrane. The chr mat n co tent incre d in many cells and the sh pes of th cells became more anaplastic and bizarr in charac t r as mal gnancy devel ped. In mal gnant changes the basement membran i lost nd dplacement of the glandula cells into th subep th lal tissues was seen. The mo e marked chan es of mal gnancy w seen on the luminal surface.

Third th p oduct n of mucus decr as d in sim ilar fash n as correlated by Galantha mucin tain as well as by hemat xilin-eosin methods.

Fourth the ability of the cells to b w d eper staining p operties was increas d.

Th pr ces f polyp format on e m t begin as an ep th lal p oliferation r as hyperplasia with n mal ph cal and physicochemical funct ns and to end as n cont olled disco d rly growth exhibit

1 g loss of ph ycochem cal fu ction an llos (n malph sical ppe rance J r P BARTLEY MD

Sto t A P G stri M cosal Atrophy d Carci n ma of th St m h \ 1943 J M 1943 45 973

There are two ppos g schools of th ight as t the rel t onship of chronic gastritis especially what is usually called chron c atroph c gastritis to carcin oma of the st mach. While some authors have come to the conclus on that chron c gastritis is a definite precane rous les n others ma tain tha ther is n evidece to suggest a tiol g cal re tw sh p othe than that chronic at ph c gastritis ma be caused o intensified by the pres nce f carcin ma in the stomach.

In th laborat ry of surgical pathology at C lumbia U i ers ty New Y rk N Y the authors stu ed multipl sect ons from 150 stom chs—50 w th gas tric ca cinoma s w th gastr c ulcer and 50 with ut gastric ulcer or c cinoma whi h ere remov l be caus of duodenal ulcer. It seemed w ith whle t st dy this material t see f a y f rther i f m r t n could be el cited which would be of value nd d n g wheth r or n t morphological changes in the gastr m cosa ca be rega ded as precac r us. These histol g cal features we e selcted for special ly sis. These w r (1) the tran format on f the gastr mucosa nto a mucosa f the intestinal typ which is commonly called ntesti l metaplasia (2) a l ss f th characterist c gastr c gla ds with the chi fa i pari tal cells; the d eport on f the st mach a d th r r plac ment by a mucosal pattern character tic of the pylorus and antrum wh ch f r co venie c may be rferred t as pylorizat o of the fundus a d (3) the d l pment f muc o cop c m c sal cysts.

The results of the study c nfirm the fi d g s of oth rs that mucosal atrophy may appear as early as the third decade d is f u d ith e r n c ca g frequency a d stent in the suc e d ng decal es f l f e. Moreov r i comparable gr ps of stomachs mucosal atrophy i found in lar r mber and tends to be mor widespread i th s with ca c than in thos with ut cancer. However when ore tries to find actu l p ogress o f om alte d m cosa g nds be they of th gastr c o n the intest n l type cyst c r n t distorted r regular it is realized that it is imposib le t ll when there is juxtapositi on of th carcin m d the m cosa gla d wh ther th carcin oma is invad g the gland or develop ng from t ep th lal cells. F rth r it can be stated that in som stomachs with ca cinomas m ltiple sections from vari us areas f il to show ry p th lal cha ges at il while n thers nly minimal cha ges at f u d.

It w lds em th efors that whil tr phy of th gastric m cosa epitheli m and cyst formatio e p esent t a greater degree rd in la g number a stom chs with ca c mas th in comparat e stomachs without ca c mas th iact latio sh; between these t o nditions rema det rained

JOSEPH K A r M D

St f r B F Car i ma De l d f om Ad It Semi
nifer u Epitl li m a Revl w f th l ltera
t re and R port of a Case i k P th Ch
1945 4 65

The author p es nts a case report of tumor of th
testicle arising from adult erun fe ou ep thelum
He has culled 8 similar ca es fr m th literature
The case repo ted exh b ts some f t res not p e
usly l scribed The metastas es in the th g are
un q e Likewise n pulmonary metastas es have
be n mentio ed pr 7 sly Th conge tal abe s of
of th right kidney and ur ter in this ca e is f
int est although its exact s gn f can e is unc rtain
U f rtun tely al aily ther a e se eral n mes
applied to this group of testicular tumors Clin cal
and l i t logical featu s and a re i w of the termi
nology a d of the posit i th gro p f tumors
th n wer clas f c t ns of test cul r m rs s ggest
th t the term a lult s minoma sh ld be gi ent
t Jo u G r M D

T mli so W J d Wilso l A J Tl Inct
d ce of M lignant Tum s In B tli H West
l di n and l n m l n Neg o Aut psies
C A 945 5 365

As a res lt of n que local ci cum ta ces n the
Canal Zo e the st ly f the t pries of th
l i t h West In l s and the Panaman A groes
r presents a r lable cros ect n of th path l g cal
fnd n s in thes peopl l i g at all ges in th s ar e
In 339 (13 29 per ce t) of 2 553 l id l t n r
m re 3 ars of age mal gn t tumors had occurr d
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ca es (14 1 per ce nt) Carci m as f e t mes a
f equ nt as s re ma and o th r m l gna t t m rs
In this series of autopses t l m l gna t tumors
sho ed es ential similar ty a t a l g f th
pat nts to those in th r po ts

Addi on ls ppo ts present d f r th bel f that
mal gnant tumors a gr i t n t cur less fre
q uently in negroe than in th wht r ce h n
l b in en r nm nt l f f nt fr th s th
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EXPERIMENTAL SURGERY

Ca It n l M J Ra m sse R A a d Ad rns
W E l Bl t l n j ry f t l L ng S grry 945
17 785

The a th rs po t o t that f t l t es f l l w g
blast injuries h e o f f led t sh w p t l g cal
b l t n s of s f f c t d e e to acc t f r th
Some p t e s m to ha e d ed from p l m ary
h m r hage som from cerebral ca l i a s ar e
nd some from mbol sm

This art cl recorus th f g s w l l g ed
a e n t mated at d cover g th ca e f d ath
f o a xpo ret re ed t b r h l p res
r prod ed bys gl l t l e b ts fa l
15 (a g n) of 18 e per m t l l g s coron ry a
mbulum wa f u d

It is su ested that in the ca es f pat ents who
have d ed immediately followin g bla t n j ry coro
nary air embolism should be kept i mind as a
possible cause of death David H Lyne M D

Greg ry R Ewing P L and Le In H A t mia
A soci ted with G st Intestin l l m
r hage An Experiment l E t l logical Study
A ch l t l f 1945 75 38

It is well estab l hed that an ele ation of the i
trog n content of the blood may be associat l w th
gastroent r c bleedin Opi ns concern g th
patho ene is of this condition h we er ar not i
ag eement Th r fore the problem w s in est gated
again e perimentally

Azotem a associ ted with gastroi test al hem r
r hage was stud ed by estur ting the f f cts o th
blood ur a nitr gen of lower ng the blood pr su e by
bl e l g of feeding d g a blood w th st mact tube
of anemia of withholding water a d of c mbina
t ns of these 62 experiment on d s

Systolic blood pressures of from 70 to 8 mm of
m rcury resulted in rises of the l l od ur a nitr g w th
t fr m 25 to 4 m gm per 100 cc l l od g w th
th st m ch tube raised the blood ur a trog n
le l to from 25 to 30 m m per 100 cc The rise
and fall f the blood urea but g n d e t ingest l
blood wa fast r than that due t low l l od pressur
Se re a m a d e t hemorrhage l i n t prod c
azot m a The combined ffect of l w l l od fress re
a l l od g a e by st mact tube produce l r p l
r ses f th blood rean tro (charact r e f th
latt r) r es of l g r d rat (charact r e f the
f m r) d higher l v l tha w l l be pected
fr m th r al

Ure cle a was r t dimin shed in d g s wh cl
w e g n blood by m a s f th at mact tube
l l l n r a clea c occurred i e ryd g in wh ch
th r was a m fca t fall i th blood fress re an l
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urea clearance a d of blood urea n trog and g w th
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n testinal bleed g

Az t mia a sociated with ga tro n testinal bleed g
may be due to d cca ed renal fu ct to low l l od
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gested blood proteins An m s not a fector Al
sorg t n of d i gested blood from the gastroi test al
tra t d es n t de e r ser nalf ction

S MOTT KAHN M D

Bl kwood W a d R sell H F rther Experi
m nt In th Study of Immersion Foot l d
burgh M J 945 5 30

The p esent gr un f e periments and th a th rs
pous st dy b sh w th that th t s in l
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l w t are the nerves A st n d m c es These
t es d g n e at e an st n t wh ch d pen upon
th a at f e spon r Th dam gen n res
gr t th a a c l l e n f n t gr g u w a l

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